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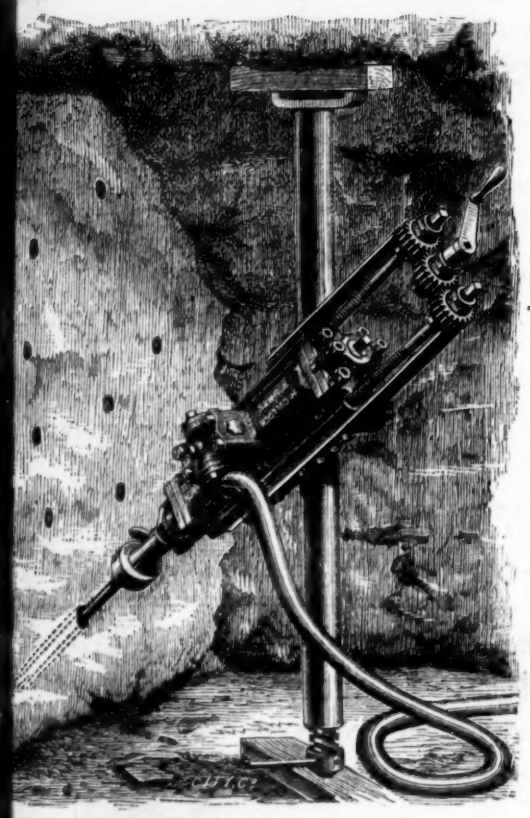

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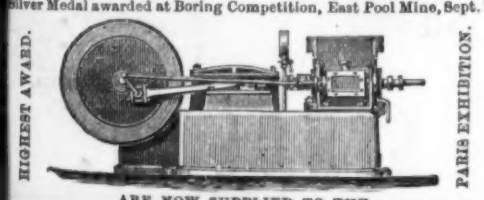

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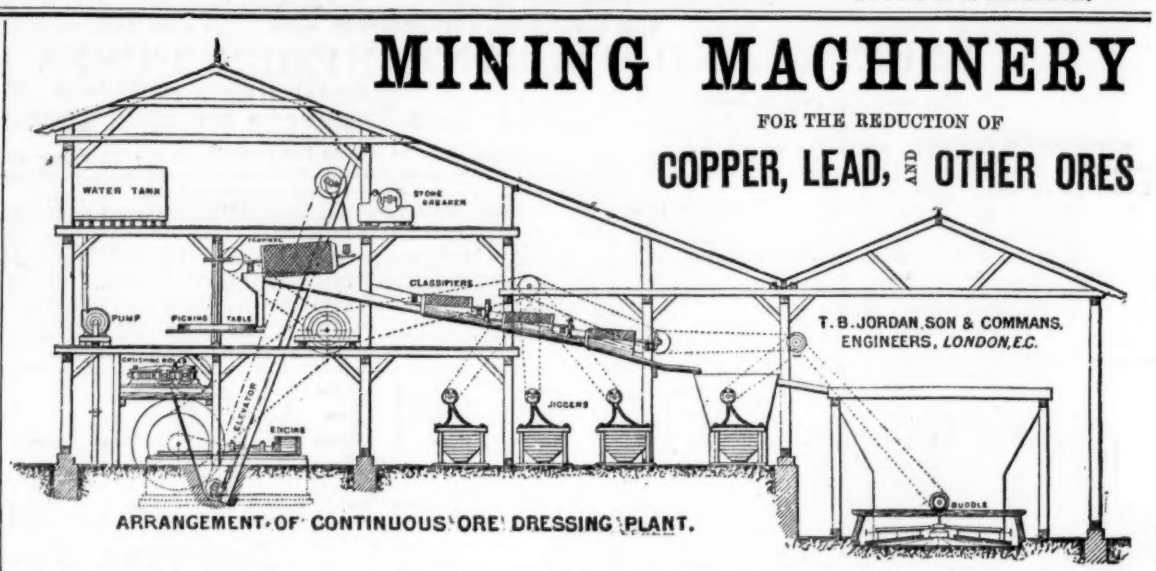

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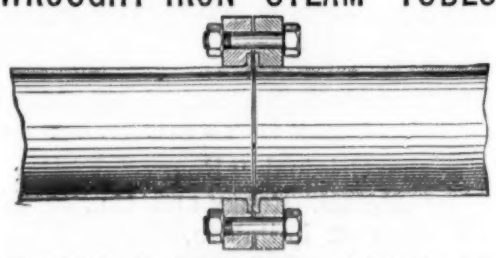

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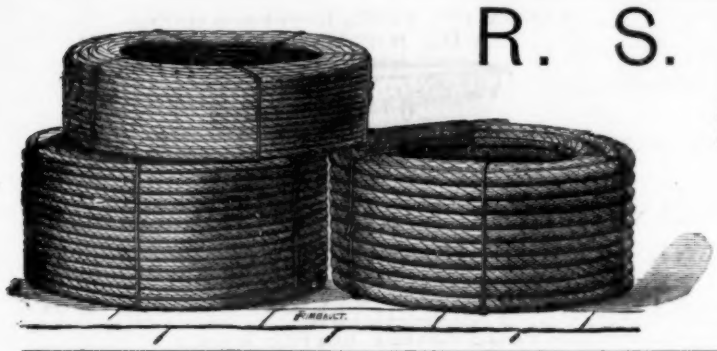

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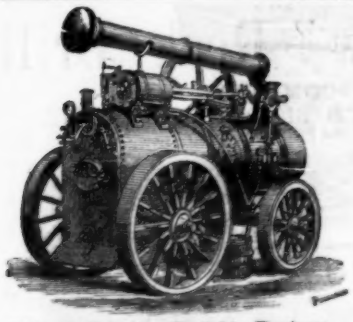

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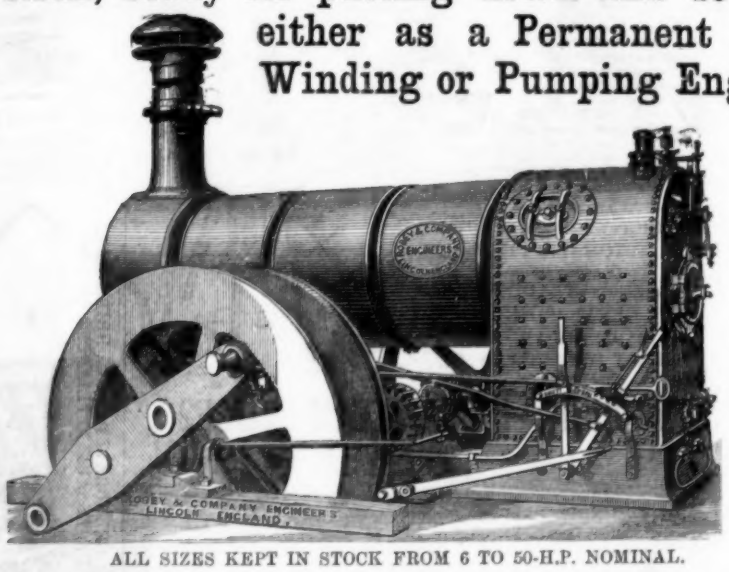

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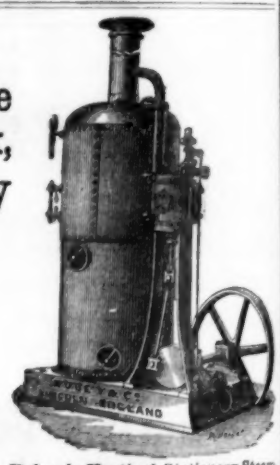

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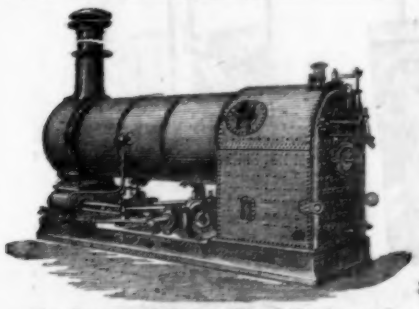

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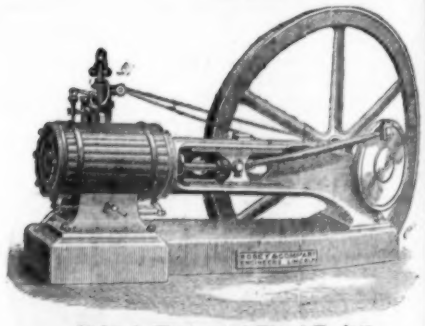

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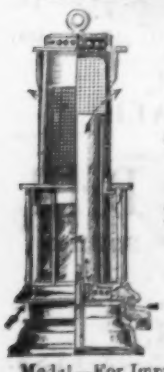

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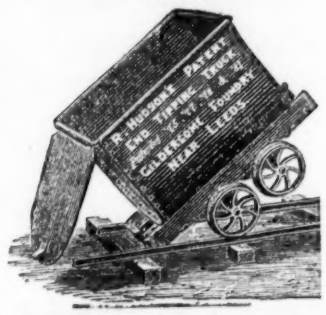
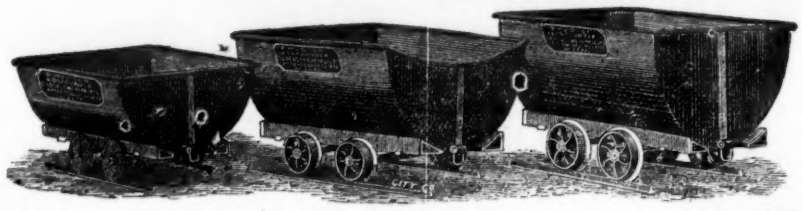
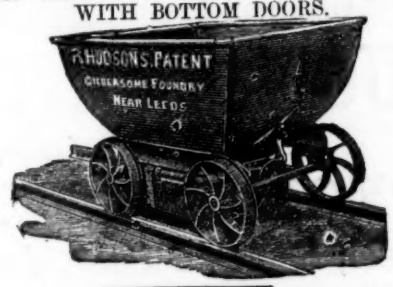


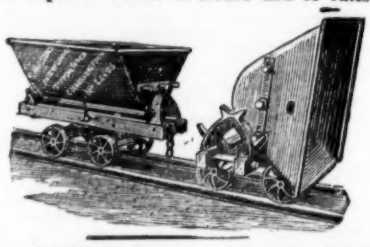
7.—PATENT STEEL MINING WAGONS.



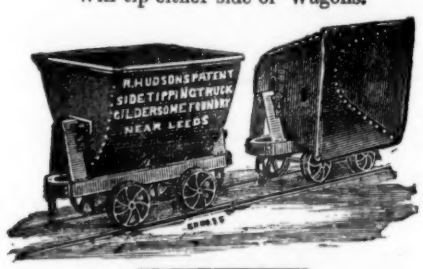
12.—PATENT STEEL HOPPER WAGON, WITH BOTTOM DOORS.



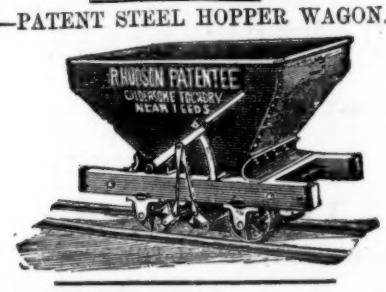
2. PATENT UNIVERSAL TRIPLE-CENTRE STEEL TIPPING TRUCK,
Will tip either SIDE or either END of rails.



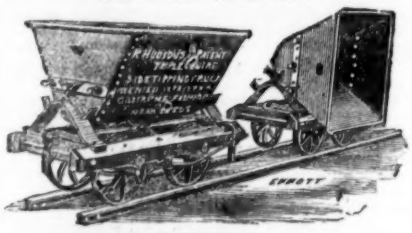
8.—PATENT DOUBLE-CENTRE STEEL SIDE TIP WAGONS,
Will tip either side of Wagons.



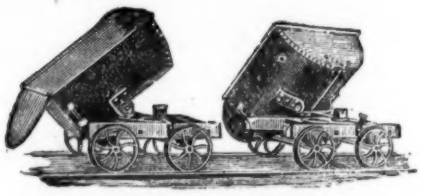
13.—PATENT STEEL HOPPER WAGON.



3.—PATENT TRIPLE-CENTRE STEEL SIDE TIP WAGONS.

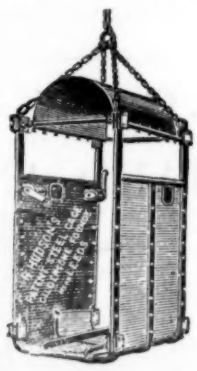


9.—PATENT STEEL ALL-ROUND TIP WAGON.



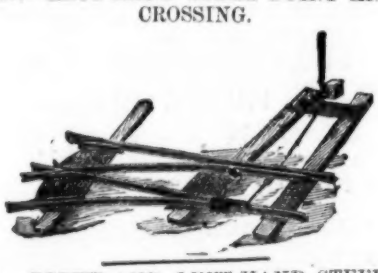
14.—SELF-RIGHTING STEEL TIP BUCKET.
(The "CATCH" can also be made SELF ACTING if desired.)

15.—STEEL CAGE.



4.—PATENT STEEL PLATFORM OR SUGAR CANE WAGON.

10.—LEFT-HAND STEEL POINT AND CROSSING.



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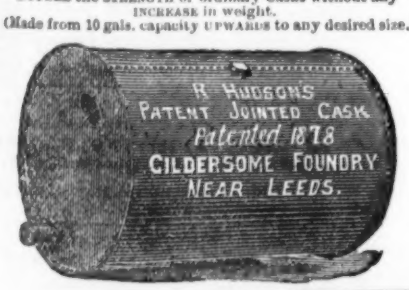
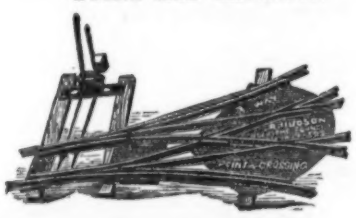


11.—RIGHT AND LEFT-HAND STEEL POINT AND CROSSING.



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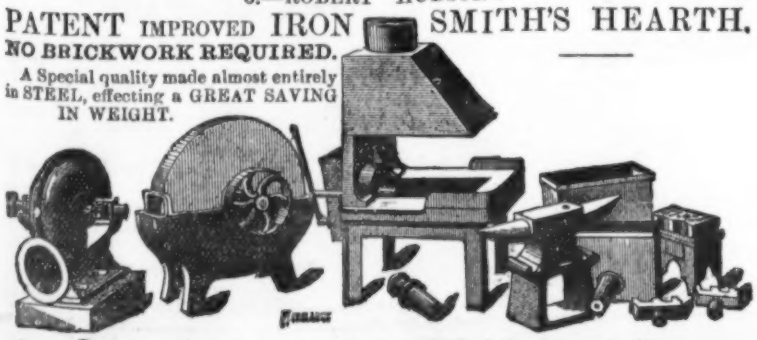

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Original Correspondence.

AN AUSTRALIAN GOLD MINE.

SIR,—The principal field for mining enterprise, so far as the investment of British capital is concerned, appears to be in America; but what would the Californian or Mexican mineowner say if he held such a property as is here described in his paper "Notes on Gold," by my friend Dr. Leibius, M.A., F.C.S., of the Royal Mint, Sydney? Not only because of the mere mountain mass of gold-bearing stone —a quarry in fact—but also on account of its easy and cheap working and the special purity of the gold itself. Referring to the remarkable occurrence of gold in Queensland, Dr. Leibius says:—Towards the end of 1882 three brothers, named Morgan, discovered about 25 miles from Rockhampton, near the Dee river, auriferous deposits, which not only on account of their richness, but especially from a scientific point of view, bid fair to be classed among the most remarkable examples of auriferous deposits yet known. The lucky prospectors have for some time kept their discovery rather quiet; but last year they had been for several months retarded in their work of developing their mine by want of water, and it is only comparatively lately that its extent and richness have been ascertained. The Capricornian, a Rockampton newspaper, in the issue of March 22 last, gives an interesting account of this mine, under the heading the Dee Gold Mine, from which and also from information and specimens kindly supplied to me by Mr. Walter Hall, of Sydney, one of the present owners of the mine, I have obtained much valuable information regarding the same. The Mount Morgan Mine, so called after the name of its discoverers, is a mountain ridge, rising about 400 ft., and consists of ferruginous quartz, in which the gold is disseminated in a very finely divided state. This mountain ridge appears to be the result of a thermo-spring which in past ages held quartz, iron, and gold in solution, and from which the gold has been precipitated in a finely divided state more or less coated with hydrated oxide of iron. As the mine is being developed caves are opened out, from the roof of which this oxide of iron and silica hangs like stalactites the size of a finger, and in which the gold is readily seen finely disseminated, as shown by samples brought here to-night. As the Capricornian, before referred to, says "the formation operated on cannot be called a reef."

The whole hill top seems to be of richly auriferous stone. It is merely cut away to suit the convenience of the miners, so that a quarry or broad terrace has been formed. The cutting is 20 ft. high and about 100 ft. long, and the stone is of the same character the whole distance, and extends to the summit of the mountain several chains higher. The facility with which the gold-bearing quartz may be obtained may be judged from the fact that a charge of blasting powder only needs to be put in anywhere along the workings, and tons of it can be displaced. The expense of securing it is, therefore, comparatively small. It is carted about ¼ mile along a good metalled road down the mountain side, and is then thrown into a wooden shoot, wide and deep, and at most 200 ft. long. At the bottom a cutting has been made for the reception of the stone, and barriers raised to prevent its progress down the hill. It is then carted about ½ mile to No. 1 battery. There are two batteries, one of 10 the other of 15 stampers, where about 230 tons are passed through per week. The before-mentioned paper says:—"The owners here possess an apparently inexhaustible deposit of auriferous quartz, and are able to mine it for almost quarter of the usual cost. They are very reticent as to the amount of stone they are putting through and the yield obtained; but we understand about 100 tons are being crushed at No. 1 battery and 130 tons at No. 2 weekly. The return is said to be not less than 5 ozs. to the ton." While, however, especially from a geological point of view the occurrence of this gold is highly interesting, the character of the gold obtained is not less so. Lock, in his work on Gold, published 1882, says:—"No gold has yet been found in Nature unalloyed with silver." Yet this gold from the Mount Morgan Mine, of which since February last already over 10,000 ozs. have been received as retorted gold at the Sydney Mint, is found to be free from silver—a minute trace excepted. I have brought some of this retorted gold rolled out very thin to show its toughness. It assays 99 7-10ths per cent. of gold; the rest is copper, with a trace of iron. Gold assaying 99 7-10ths per cent. is worth 4*l.* 4s. 8d. per ounce. Gold from the same mine received at the Mint assayed as high as 99 8-10ths per cent. It is, as far as I know, the richest native gold hitherto found.

The richest gold next to this comes I believe from Maryborough, Victoria, which assays 99 3-10ths per cent.; while that from its namesake in Queensland contains only 85 per cent. gold. F. B. Miller, in his paper "On Gold Refining by Chlorine Gas," read before this society in 1869, alludes to the curious fact that as a rule the gold contains more silver as we go northwards, giving the average fineness of Victoria gold as 96 per cent., New South Wales 93 per cent., and Queensland 87 per cent. He says, however, "These are averages only. It is not to be supposed that there is a regular and consecutive diminution in fineness with every degree of latitude we go north. There are exceptional localities in the north of this colony, as at Rocky river, where the gold is over 96 per cent." To these exceptions we must now add the gold from Mount Morgan. Having now shortly described the remarkable occurrence and purity of this Mount Morgan gold, a not less interesting though less satisfactory fact is this—that only about half the gold is extracted by the ordinary quartz crushing and amalgamating machinery. The Capricornian says:—"The tailings which are being stored are said to contain as much gold as is saved, and as they will be subjected to treatment at a future date the result will be highly advantageous to the owners." Having the small quartz crushing machinery erected at the Sydney Mint under my charge I have had an opportunity of testing this fact. In November last we received through Mr. Hall, of Sydney, 458 lbs. of this ferruginous quartz, part of it consisting of picked stone. It was carefully crushed and amalgamated in the Chilian mill with 240 lbs. of mercury. Thus 7·44 ozs. of gold, assaying 991·5, were extracted. Another lot, weighing 174 lbs., was similarly treated, and 12·12 ozs. of gold extracted, assaying 998·2. Thus lot one gave gold at the rate of 39·32 ozs. standard per ton of quartz; while lot two gave gold at the rate of 169·86 ozs. standard per ton of quartz. In lot one gold at the rate of 46 ozs. 2 dwts. 12 grs. per ton was left in the tailings; while in lot two the tailings assayed 64 ozs. 5 dwts. 18 grs. of gold per ton. Both lots of tailings were now mixed and passed for two hours in the Chilian mill with 240 lbs. clean retorted mercury; only 1·66 oz. of gold, assaying ·981, were however, obtained by this treatment. The tailings were dried, and found to weigh 476 lbs., containing gold at the rate of 41 ozs. 13 dwts. 16 grs., or in above 476 lbs. tailings no less than 8 ozs. 17 dwts. 3 grs. of gold. I have brought some of these tailings here. Under the microscope there is no gold visible. I thought that if the oxide of iron were removed by boiling the tailings in hydrochloric acid and the solution filtered off the gold might more readily be discernible in the boiled-out residue. I found, however, that this was not the case, and that 1000 grs. of tailings thus boiled in strong hydrochloric acid, by which about 20 per cent. were dissolved, gave me only 0·730 grs. of pure gold, while 1000 grs. of the original tailings not boiled out gave 1·306 grs. of gold, the same as when boiled out within nitric acid.

The loss of gold by boiling in hydrochloric acid was no doubt due to the action of this acid upon manganese in the ore, whereby chlorine gas was formed, a ready solvent for gold. That the ordinary amalgamating Chilian mill did not extract all the gold in this stone I can only attribute to the supposition that the oxide of iron has literally coated some of the fine gold, thus prevening it from coming in contact with the mercury. For such ore Plattner's chlorination process, if worked on a large scale, ought to be highly successful. I am glad to hear that arrangements have been made by which the tailings will presently be treated at the mine by the chlorination process, whereby the gold is dissolved by an aqueous solution of chlorine gas, and precipitated by hydro-sulphuric acid. It would, however, be interesting to see whether some or any of the numerous patent gold extracting machineries or appliances would be able to overcome the difficulty, and to trent economically and successfully these tailings or the original ore. That it would be of great advantage both to a patentee and the owner of this mine is evident. While on this subject I may be permitted to allude to the want in this colony of a mining laboratory, supplied with all the appliances not only for examining ores, but for extracting by the most approved methods their metalliferous treasures on a large scale. Of course such an establishment would be both extensive and expensive, but while giving valuable aid to mining enterprise it could be made not only self-supporting but remunerative.

In spite of its now proved wonderful richness it might have remained unknown, or at least unworked for years, had it not been for the enterprise of the Mr. Walter Hall there referred to, who backed up the discoveriers with his capital and influence, and so assured the successful opening up of the mine. He is a man of wonderful energy and shrewdness, and his courage is only equalled by his capacity for dealing with large enterprises, which require at once insight and foresight; and both Queensland and New South Wales owe him no small debt of gratitude for the great aid he has been to them in helping to develope their mineral, pastoral, and other resources.

Sydney, July 9. R. D. A.

COLORADO MINES.—No. XXVI.

THE MOUNTAIN AIR COMPRESSOR—POWER WITHOUT COST.

SIR,—In nearly all the mountain mines very little heavy machinery is required for the first few years of their working, as there is generally very little water to contend with, the drainage being effected by adit levels and tunnels; exploring shafts and winzes alone needing hoisting or pumping appliances. In using machine rock-drills, which no mine should be without, steam power is necessary, and this is an expensive thing, for all the fuel, and in some instances the water, has to be hauled up the mountain from 2000 ft. to 3000 ft. in height from the valley below; skilled labour also is required to run the engine, with many other attendant costs. Now, with my new arrangement neither wood, water, coal, horse power, or skilled labour is needed; the summer winds travel from 6 to 20 miles per hour, and a dead calm is of rare occurence above timber line; an average during the autumn and winter may be taken at 25 miles per hour, heavy gales go 60, and hurricanes from 80 to 100 miles. To utilise this free power I propose to adopt the following mode of operation:—At some convenient site near the lowest level of the mine I erect a wind-engine of about 10-horse power; the velocity of the wind shall average 15 miles per hour, which will give a net pressure on the sails of 1 lb. per superficial foot, the area exclusive of clearage will be 480 ft., producing an effect of 480 lbs. in the central line of gyration, giving a powerful leverage, the speed will be eight revolutions per minute, the wind 1320 ft. in the same time. This will be on a skeleton tower 25 ft. high, made of framed timbers; no buildings are required for the machinery; the sails are self reefing, either by springs, weights, or rollers, any excess of wind, therefore, opens the shutters above 1 lb. pressure on them, giving a nearly uniform speed. I have an improvement, however, on this old plan of Smeaton's; but as I have not completed my working model of 1-horse power, I can say but little about it. I am desirous of guarding against accidents from furious hurricanes, of which we are subject to in these mountains; besides to prevent the chattering and twisting of the sail shutters; my design is to make the sails of light strongly revetted sheet-iron. There will be two tail fans, one at right angles with the other on the revolving rack-geared head of the mill, with a heavy ball governor; with an increment of speed exceeding eight revolutions of the driving shaft per minute the governor will come into action and throw the line tail fan out of gear, and bring the quadrant angle fan into play. This will, as the wind acts upon it, turn the mill head until the sails come into a right line with the wind if it should continue to revolve. When the power ceases, as the wind slackens in speed, the head will return to its normal position, when the tail line fan will again drop into gear. There will also be a brake attached to this extra fan. I think this arrangement will prevent accidents, even in a whirlwind. The vertical shaft, for the convenience of transportation, will be made of 5 in. gaspipe, or of such diameter as to transmit the driving strain without tortion, and I would prefer all the bed framing to be made of wrought iron for the same reason; the step will be placed on a bridge piece, so that the centre of power shall be in a line with the compressing machinery; a three-throw lay crank shaft forms the third motion. This is geared up to run at a speed of three to one of the driver, or 24 revolutions per minute. The cranks are 6 in., giving a 3 ft. stroke per revolution; each of the three compressing cylinders have separate delivery pipes, so as to shut one or more off when not required. They have solid plungers for pistons of 1 ft. stroke, with patent detaching connecting rods; they are 4 in. in diameter, and the delivery valves set to open at a pressure of 100 lbs. per square inch, compressing 6·28 cubic feet of air per minute of this density; to effect this will absorb 2714-horse power from the 10 of the engine; thus 12,566 area of cylinders × 72 ft. × 100 lbs. ÷ 33,000 = 2714 effective horse power. Close up to the ends of the cylinders is a water jacketed receiver secured on the same bed-plate of 100 cubic feet capacity. Being surrounded by snow or very cold water the air will be greatly reduced in temperature before it enters the main receiver; this can be fixed at any place, but close to the entrance of the main tunnel by preference. Its cubical capacity should be sufficient to supply cold air to every machine in the mine for one working day at least. This is the storage reservoir always blowing off when the engine is in motion at 100 lbs. per square inch. Next is the working supply receiver, set with regulating valves to blow off at 40 lbs. per square inch, being the constant pressure throughout the mine. The air main will be fixed in the crown of the tunnel of 3 in. diameter or bore; from it branch pipes will be set off to every working place where power is needed.

The Screw Whim.—This is an excellent machine and saves the labour of three men or a horse and two men in exploring shafts and winzes. It is in the form of a screw winch; hitherto I have had only steam or water power to drive it, using reverse belts from the drum and friction cone clutches for disengaging; an ordinary common link hoisting chain is what has generally been used, but it is very liable to break from the heavy wear on the links by abrasion, friction being very great. I substitute this now by steel link belts, in which there are many advantages. They are lighter, stronger, more durable, and run with less friction; besides, there is no possibility of their slipping on the pulley. Over the winze or shaft to be sunk I construct a strongly well braced frame or poppet head; on this placed a 5 ft. polygonal winding-wheel, each face being of the same length as the links of the belt; it is geared on its outer edge, the cogs being 2½ in. pitch. These are cast in segments, so that in case of a cog breaking out a duplicate segment can be put in without any waste of time. Into the winding-wheel works a screw or worm wheel 9 in. in diameter; on the shaft of this is a high pressure double reversing air turbine 20 in. in diameter, the pistons are 3 in. diameter = 7·06 in. area, the pressure of the air is 40 lbs.; deducting 14 lbs. for the atmospheric resistance, its net effect will be 26 lbs.; the speed of the effluent air is 1448 ft. per second. The weight this will lift when the pressure is all on is 183·56 lbs., exerting 25 nominal horse power; but not more than one-fifth of this is needed, as the speed is 160 revolutions per minute; the loaded kibbles are 600 lbs., speed of same in the shaft 200 ft. per minute, the winding-wheel making 12 revolutions, this is only 3·66-horse power; therefore, double the speed or its load is instantly attainable, there being a great surplus of power. The screw is preferable to any other motion, as there is no back lash, and runs smooth without any jarring. The turbine has a "three-way" disc face valve; therefore, only one lever is required for starting, stopping, or reversing. When this hangs vertical all is closed except the opening between the main and air chest; on turning it either way 33° either of the induction ports are opened or closed at pleasure. It will be seen that only one man—the lander—is required to hoist and tram out easily 50 tons per day. The kibbles by a self-tipping arrangement empt direct into the truck. This runs out by its own gravity, and is received by the men on the ore-floors as it emerges from the mouth of the tunnel discharged, and a signal given to the lander to haul back, which is effected by a small wire line laid between the rails coiling on a drum run from the turbine at the shaft. There are many advantages attending the link winding-belts; by withdrawing one of the bolts the chain can be shortened or lengthened at pleasure. When drawing from several levels—every 10 fathoms—no slack is necessary; between the levels hung to a hook by the side of the shaft is a spare 20 fathom length, so that when it is required to draw from the next level below this supplementary chain can be instantly connected.

Drainage.—By my improved system no pump whatever is required, let the quantity of water be what it may. I introduce the link belt scoop water elevator; it is driven direct by a small air turbine, the chain running from 40 to 160 ft. per minute in the shaft. If the water is in excess a few extra buckets can be put on, they are merely fastened by one of the link bolts; a greater speed would effect the same purpose which can be had at will, for this turbine, being a very small one, makes 300 revolutions per minute. A moderate speed is best on account of the concussion of the air when the bucket strikes the water; to obviate this a small leather flap valve is fixed to the bottom of each bucket that lets the air out and closes as it emerges from the water. The elevator I have now in hand is designed to drain a shaft producing 30 barrels, or 1200 gallons, per hour; it is 200 ft. deep, the scoop buckets are 3 ft. apart, and contain half a gallon each. The lifting belt wheel is 9 ft. in circumference, making 17⅔ revolutions per minute, the belt running 160 ft. per minute in the shaft. There are 53 buckets in this length, therefore it delivers 26½ gallons, which multiplied by 60 shows that it is elevating 1590 gallons per hour. It uses up 1·28-horse power to drive it; the belt runs under a 20 in. wheel that is placed in a long vertical box in the sump, fixed securely to the bearers by moveable clamps. On the backside at the top is a swivel hook, and when blasting is going on the speed of the belt is slackened and this hook thrown into one of the links, when the sump box and its contents are hoisted up as far as needed to get clear of the shots. The slack of the belt falls into the box as it ascends; the kibbles are lifted up out of the way in like manner, so that the bottom of the shaft is now clear for blasting operations. It will be seen that no hard manual labour is required, or any time wasted in clearing away obstructions. The Blake crusher, spalling machine, and revolving griddles on the floors are worked in a similar manner. No bellows are wanted in the smiths' shop, and the circular saw, lathe, and other tools are run direct from a 1 in. air pipe; no long line of shafting is wanted. I propose making these air turbines from 4 in. to 4 ft. in diameter, running respectively from 100 to 1000 revolutions per minute. I do not claim only a few parts of the machinery and implements in this economical method of working a mine as anything new; but I do claim as my invention the arrangement and adoption of certain well-known mechanical powers as an entirety for the purposes herein set forth. Drawings, specification, and estimates could be supplied, and the work superintended if it is in Colorado.

Alma, July. CHARLES S. RICHARDSON, G.M.E.

ANGLO-AMERICAN MINING ENTERPRISE—HINT TO CAPITALISTS.

SIR,—I have been informed that an attempt is about to be made to sell in London a mine in this [Utah] territory, which, in my opinion, is not worth a pound of candles to any English company. The name of the mine is the Crescent, and it is situated near the Ontario Mine, at Park City. I know the Crescent Mine, thoroughly and I say that if it is as valuable as those now interested say it is, people need not go out of Utah to get money to work it. The company is now laying down a tramroad from the mine to Park City, and are also going to put up a new concentrating mill and several other things. But, in my opinion, the appearances of the mine do not warrant any such outlay, and the question I would ask is—Would the present company lay out one-fiftieth part of the amount they are expending if they were not thinking to make a big sale of the property? I do not say that the mine is a bad speculation, but it is a speculation only, and not such a property as I would connect myself with as a shareholder, or recommend to my friends. I do not wish to hide my identity, and will, therefore, say, that many readers of the *Mining Journal* know me as Capt. John Treweek, sen., late of Combmartin, North Devon. It is equally to the interest of English capitalists and of American mineowners that none but properties likely to yield fair profits should be placed on the English market.—*Lead Mine Hill, Aug. 3.* JOHN TREWEEK, Sen.

THE UNITED STATES, AND LOCAL PROTECTION.

SIR,—It is marvellous to observe how difficult the thorough-paced hard-headed Protectionist finds it to admit that "what is sauce for the goose is sauce for the gander." Protection being just now very fashionable in the United States someone has been bold enough to put the very natural question—Why not Protection between the States? With reference thereto the Boston Commercial Bulletin writes:—"With many apologies to readers of the Bulletin for appearing to insult their intelligence by entertaining such a foolish question we reprint the following from an article in the Boston Herald of Saturday July 19:—Again, if it is Protection that makes a State great and wealthy is it not an error in the Constitution to prohibit the various States of the Union from each benefiting by the local adoption of this method?"

A Yankee answer, continues the Bulletin, to our contemporary's enquiry would be—If it is a good thing for the United States to coin money, make treaties, and keep ships of war, why should there be a Constitutional inhibition of those privileges to the individual State? The very word "Protection" implies that it is directed against something. That our Protective tariff is against the interests of Great Britain and some other foreign nations, we have abundant evidence in the assaults of writers upon both sides of the ocean. But it would be as wise to erect a line of forts between Massachusetts and Connecticut, or to put a fleet of gunboats upon the Merrimac at the expense of this Commonwealth, as to permit a tariff to be levied between the States. It ought not to be necessary to tell anybody in this era that each State has to waive some privileges for the sake of the Union. In all our arguments for a Protective tariff we have made the condition that Protective duties should not be put upon articles which cannot be eventually produced here as cheap or cheaper than in other countries. One of the reasons, however, why Protection is essentially an "American system" is because the varied soil, climate, and other natural resources of our great expanse of territory afford opportunities for selecting fit sites for a very large proportion of all the industries known to the world. It is an advantage to the inhabitants of Massachusetts to have the manufacture of iron transplanted from England to the United States, even though it may be located in Pennsylvania instead of our own State. Likewise, it is beneficial to us that the production of pottery should be transferred from Staffordshire, England, to American soil, even though its seat be found in East Liverpool, Ohio, instead of Boston. The slogan of the Protectionists is not New England for the Yankee nor Indiana for the Hoosiers, but America for Americans. By Americans are meant all who will come here and obey our laws and identify themselves with our institutions. The tariff is not a local issue.

Now, every Free Trader, whether American or European, will see at once that it is the Bulletin readers who lack ordinary intelligence. The adoption of a Protective tariff by the United States can never injure any other country except temporarily, whilst the injury it inflicts upon the people of the United States is incalculable. Lead can be produced in Spain and Great Britain at 10*l.* per ton, so that those countries can supply almost any country in the world at 12*l.* or 13*l.*, and secure a profit. Hence if the American duty be 9*l.* per ton the price of lead in America will range between 21*l.* and 22*l.*, because foreign lead cannot be imported at a profit below those prices. But supposing the American producers (though as they are in the hands of their workpeople they have very little power in the matter) were able to produce their lead at 15*l.* per ton they would still have all foreign markets closed to them, as they could only sell at 5*l.* per ton above Spain and Great Britain. If the United States consisted of a thousand islands of equal size instead of being one continent the case would be somewhat different, and they could then enjoy Statal intercommunication by water, but at present their land carriage must devour them. Newcastle coal can be sent into Berlin in competition with German coal, which has only 200 miles to be carried, because the land carriage—that is, carriage by railway in-

creases with the mileage in a much greater proportion than water carriage. Similarly why should San Francisco be compelled to buy Pennsylvania coal and iron at a high price because it is produced within the Union if it can buy Vancouvers, or other foreign coal, at half the price? or why should New York pay a high price for Pennsylvanian coal when it has Nova Scotian coal close at hand. Canada has just as onerous prospective duties as the United States, so that European Free Traders have no sympathy with Canada; but it cannot be too strongly urged that if a nation would be great as an industrial and manufacturing nation it must seek to keep the prices of everything—of raw material, of labour, and of transport—below that of its competitors. The Boston Commercial Bulletin in advocating Protection is really playing into the hands of European manufacturers.

New York, Aug. 3. VERITAS.

DEVALA MOYAR GOLD COMPANY.

SIR,—Could not some steps be taken by the directors of the Devala Gold Mining Company to expedite the work on the tunnel now being driven to open up the Harewood reef. For many months past the rate of progress has been at the rate of less than 4 in. per day. It is stated that rock-drills costing 50*l.* will bore into granite at the rate of 1 to 2 in. per minute. On March 10 the supposed distance to be traversed to Harewood reef was 54 ft.; on July 18 the supposed distance was 14 ft., and may, perhaps, be 50 ft.—if the dip of the reef should not coincide with surmises—in which case about 20 more weeks may pass away before reaching the reef. SHAREHOLDER.

Pall Mall, Aug. 18.

DEVALA MOYAR GOLD MINING COMPANY.

SIR,—The *Mining Journal* of July 5 inserts mine manager's report of progress of Devala Moyar Gold Mine, under date June 6. He states—Salomon's Reef: We are making every exertion to connect the winze and the lower tunnel before the rains set in. They are getting pretty close together, as the slightest noise in one can be heard in the other. . . . The winze has been sunk 5 ft. more; in sinking this winze or shaft we have passed through quartz, containing good gold. . . . Manager, June 12—Salomon's Reef: The lower tunnel has been driven 14 ft. for the week. The winze has been sunk 2 ft. only, as the air in bottom became so bad that we could only work half time in it. Manager, June 27—Salomon's Reef: We have been unable to work in the winze, owing to the quantity of water in it; the lower tunnel which will drain it is now within 15 ft. of the bottom of it. A landslip near the mouth of this tunnel was occasioned by the floods, but it will not involve more than a week's delay. Manager, July 4—Salomon's Reef: We are busy clearing out the opencutting leading to the lower tunnel, and it will take us nearly a week more to put right the damage caused by the landslip. The winze has 80 feet of water in it. Manager, July 11: We have just cleaned out the lower tunnel, and found that the landslip broke some of the timbering. Manager, July 18—Salomon's Reef: There is little new to report, but I am pushing on the work as fast as I can. The new tunnel will be so thoroughly timbered in a few days that it also will be secure.

It would be of interest to know if any effort at ventilation was made on or about June of the present year to enable the miners to work in the shaft at Salomon's reef, or whether in view of the approaching monsoon and the urgent importance of completing the shaft and tunnel relays of men were put on both day and night. It would appear that 14 ft. of the lower tunnel was completed in the week ending June 12, so that if men were not employed in the tunnel at night it seems an unpardonable oversight, inasmuch as one week's night work would have completed the tunnel before the monsoon caused the landslip, which blocked the tunnel and flooded the shaft to the depth of 70 ft. a few days after, and has interrupted the work and the development of that part of the mine for about a month. It is to be hoped that shareholders will insist on a full explanation being given. It would be a conclusive answer to say that such practical matters were left to the manager. SHAREHOLDER.

Pall Mall, Aug. 19.

CALLAO BIS GOLD MINE.

SIR,—I see by the weekly reports of the Callao Bis Gold Mine in the *Mining Journal* that very little is being done there; but my opinion is that it is the best piece of property in Venezuela, South America, with the exception of the great Callao Mine. If good practical men were in charge the above mine would soon become a dividend mine instead of what it now is. There is a great lode, 5 ft. big, nearly 700 ft. high, going towards Callao Bis property from the great Callao Mine containing the very quartz that the great Callao Mine sends away all her gold from. The end in No. 4 shaft at great Callao Mine is in 350 ft., and the quartz will give from 2 to 3 ozs. to the ton, and this is going towards Callao Bis property.

There is but 600 ft. standing between the great Callao Mine and the Callao Bis Mine; and why should the above mine be so poor when the lodes all run in that direction? I speak from experience, having spent three years at the great Callao Mine.

Beeralston, Aug. 20. STEPHEN TREVENA.

BOGUS SCIENCE—THE MINE INDICATOR.

SIR,—The imposture of the dowsing rod has more than once been demonstrated by discussions in the *Mining Journal*, but out here we have just been treated to a refined piece of deception of the hazel twig character, and lest the perpetrators of the absurdity should deem it worth their while to attempt to play off their jokes upon the more credulous English I subjoin cutting from a recent issue of the Nevada (California) Tri-Weekly Herald:—"Over 100 persons, says this newspaper, went out from town yesterday (July 21) forenoon to witness a test of the mineral indicator that Dr. E. B. Lighthill, lately of New York, is endeavouring to introduce to the people of Nevada County. The test, or more properly tests, were made at the old Williams Ranch, on Peck's ravine, not far from the Providence Mine. We did not witness any of the experiments, but sent a reporter, whose opinion of the working of the machine is given elsewhere. The general opinion of those who were present while the tests were being made is that the indicator is a signal failure and a 'hoodoo' of the worst kind. It would have pleased us very much had the indicator accomplished one-half what was claimed for it, but from all accounts it did not give the slightest demonstration that would argue in favour of its practicability. The manner of its introduction here convinced us that the apparatus would prove a failure. If the inventor and owners had full faith in the indicator they would have been apt to quietly buy up a few mining locations for themselves before giving a public exhibition of the machine by which it is claimed the whereabouts and richness of ore deposits can be determined. It is quite natural for people of Nevada County to be sceptical regarding such matters. They have been fooled several times by mine indicators and new processes. The gigantic humbug know as the Fryer process has not yet been forgotten. Everybody hopes, and many believe, that the day will come when the exact location, extent and value of ledges can be determined from the surface by instruments, and when rebellious ores will be profitably worked. That day has not yet arrived.

A correspondent of the same paper gives further information on the subject as follows:—In company with many of the scientific miners of this city, your correspondent visited the scene of the experiments which were yesterday made by Dr. Lighthill with what he calls a mine indicator. It is claimed that all mineral veins carry an electrical current, and that such current will communicate itself to the indicator, and be demonstrated by the action of a galvanometer We have not given the matter that attention which would warrant us in saying that the first of these propositions are true; but in our opinion, even if it is, nothing was demonstrated yesterday to prove either the first or the last. The experiments made were not of such a nature as would demonstrate the presence or absence of a mineral vein. Two bars of steel are driven into the ground about 8 in. apart. These are connected to the poles of a battery, and the endeavour was supposed to be made to take the current from the earth and indicate it by the needle. To our mind this was not done in any of yesterday's experiments. We came to the conclusion that the current passed from one of the electropodes to the other through the earth, and particularly so when they were placed in the wet soil, as the most rapid indications were made in the bed of the stream, where there was plenty of water, which is a good conductor. On the contrary, when they were driven in the croppings of the Providence ledge no indications whatever were received.

As we said, these experiments proved nothing as to whether there is a current in a vein, or as to whether that current could be successfully indicated by a machine. The wonders of electricity are but just beginning to be appreciated, and every man who spends his time in experimenting is in danger of discovering something new. We believe in encouraging experiments in electricity to the fullest extent. It is a science in which men are groping in the dark, and one of experiment. Some occasionally discover a new wonder in connection with it, and stranger things have already been shown than that a certain amount of it exists in a quartz vein which can be demonstrated by a machine. It is thought, we believe, one of the things which is yet to be discovered, and we would not like to rely on such experiments as were made yesterday if we desired to invest our money in mining. We should as yet prefer a stout, practical miner, with a pick and shovel, if we wanted to hunt for a quartz vein.

I think it was your Dr. Tyndall that showed that he could produce by mechanical force all the so-called phenomena which were attributed psychic influences, yet we still find enthusiasts, or worse, seeking to gull the public with their pretended discoveries. You are of course aware that American titles are assumed by the users about as frequently as they earned by them, so that it would be waste of time to enquire what college or university this miraculous Dr. Lighthill hails from, especially considering that, supposing him to have received the title from an academic body, the college that graduated him would scarcely feel proud of their pupil. The San Francisco Mining and Scientific Press, in which I read the Nevada Herald's account, remarks that they anticipated that the indicator would prove a fizzle, and a fizzle it is, and no mistake. T. BARTLETT.

San Francisco, Aug. 1.

COPPER MINING IN NEW ZEALAND.

SIR,—Having just arrived in England from New Zealand, and being interested in mining generally and in the Champion Mining Company, Nelson, particularly, I thought it would prove interesting to readers of your valuable paper to hear a little definite information regarding it, as well as to help to place the mine on a proper footing as regards the share market, though at present it would be difficult to find sellers at any reasonable price. The mine is situated on a branch of the Roding river, within 2½ hours' gentle ride of the Richmond railway station; the mouth of the mine could be easily reached by railway grade running up the river valley by going a little further round.

The lower level at the Champion workings has been driven 175 along the supposed course of the lode and carried rich ore for a distance of 35 ft., and again between 60 and 100 ft., after which it has been barren, having apparently left the lode to the south. At the same level on the other side (north) a drive has been put in over 100 ft., and has struck the lode fine and strong, and carrying native and grey copper. At 28 ft. from the entrance of the south drive a winze has been sunk on the lode for a depth of 95 ft. on the footwall; the lode consists of a soft shaly serpentine, which is studded throughout with grains, plates, and masses of native copper, some of which are over ¼ ton in weight. At a distance of 105 ft. from the mouth of the mine a cross-cut was put in to cut the outcrop known as the Doctor's lode, and after driving a distance of 140 ft. a lode was struck 15 ft. in thickness, consisting of pyrrhotine and native copper, the latter passing through it in veins which traverse it in all directions.

On apparently the same lode 2000 ft. to the northward is situated the drives of the United Company (which is now amalgamated with Champion); the lower drive is in 84 ft. on rich yellow ore, and is 9 ft. wide at the end of the drive. The upper drive is 84 ft., lode 14 ft. wide, with splendid ore, of which I send you a sample. Further up the side of the hill the lode outcrops, showing a high face of black oxide, silicates, and sulphides partially decomposed by the action of the weather. The advantage with which the mine can be worked, having nearly 1000 ft. of backs level free, is a great consideration, as also the easy nature of the country for road construction to the Old United Company's tunnel, which when extended about 2000 ft. through very soft country will give us two lodes of that length, 1000 ft. high in the highest part to stope from.

London, Aug. 20. W. J. REYNOLDS.

MINING LEASES.

SIR,—On looking over the Supplement of the *Mining Journal* of Aug. 16 I read in the letter of Mr. T. A. Readwin, F.G.S., on "Gold in Wales," the sentence:—"Whilst adventurous people of the mining persuasion were both able and willing to pay high rents and royalties for mineral leases, mine lords were quite within their right in taking all that people were willing to give them." Just so, and because applicants for leases never tried to get better terms than the lords, or their agents, proposed the evils complained of have been continued of till now. It is remarkable that the absurd conditions contained in mining leases should have been acquiesced in so readily and so long as they have been. Applicants for leases appeared to think that the conditions were irrevocable, instead of regarding them as subjects for discussion and arrangement. Lords are in general reasonable men, and will listen to reason if you consult them, an instance of which you have in the case of Tincroft lease, where Lord Robartes granted a new lease on the terms submitted by Capt. Teague, the lessee. Nearly all the landowners have agents, who, out of zeal for their principals, impose terms which bear hard on the mineral tenants, and I suppose those who want mining leases are afraid to offend the agent by an appeal to the lord, or they may fear that such an appeal would be unavailing, if made. Besides, persons applying for leases are so anxious to secure them that they readily accept any terms, especially when they take setts for sale. It is high time that legislative action should be taken in this matter, because the prices of minerals are high, the labourers' wages also, and most of our mines are deep, and, therefore, expensive to work. I know that it is no easy matter to abolish old-established customs, but when those customs are proved to be unreasonable and oppressive they should give place to those which are consonant with reason, and the fitness of things.

I wrote you sometime ago submitting what I considered fair terms for mineral leases.—1. The term should be for 60 years.—2. Out of profits about 1-12th should be paid to the lord as his "dues." He should have dues out of profits only.—3. For land destroyed by mining such price should be paid as a valuer or referees should determine, instead of the exorbitant price now covenanted to be paid (in some cases 100*l.* per acre).—4. Buildings erected by the lessees, or their assignees, should be their property for a long term of years, unless the lord chose to purchase them upon the cessation of works.

I do not see how any reasonable being can object to the above terms, which, in my judgment, are fair and equitable. Of course, the usual provisoes for re-entry, &c., would be inserted in the lease.

Truro, Aug. 18. R. SYMONS.

MINERS' WAGES—WHEAL SINGER.

SIR,—I like to see the working men earning good wages, which are now much higher than they were 50 years ago, when provisions of all kinds were much dearer, for then the abominable Corn Laws were in operation. I believe that at the present time the average earnings of miners is about 4*l.* per month, while the prices of all our mineral productions are low. Tin is higher than it was half a century ago; but copper is not more than about half the price it was then, and copper mining is almost extinct in West Cornwall.

In the years 1823 and 1824 I was the purser of a little mine near Wheal Vor, now called New Great Wheal Vor, then called Wheal Cruset. It was worked on a very small scale by an old gentleman, called Wallis (a somewhat eccentric retired solicitor), who was the mineral owner of the land called Pengwedna. He had there two captains—Hugh Pascoe and William Bawden. The first died soon after; the last was afterwards for several years an agent in Wheal Vor. Each of these agents had only 2*l.* per month. The miners had about the same. The same old gentleman, who farmed the land surrounding his residence, paid his labourers only 7*s.* per week; his hind and coachman 14*s.* each.

The agents at Wheal Vor had six guineas each per month, except Capt. Thomas Richards (the manager under a committee, and also the engineer), who had 12 guineas per month, which at that time was considered a very high salary, The agents of the Wheal Vor United Mines, except Richards, had not the honour of dining with the committee or adventurers; they dined alone, as servants in a gentleman's house. They were kept in great fear. Richards was an ingenious man in engineeeing, &c. He constructed an organ for Carleen Wesleyan Chapel. All the agents have long since passed away, and nearly all the mines in the district are idle. Many houses vacant; some gone to ruin, and the parish to a large extent depopulated. A hope exists that the mining industry there will revive shortly, by the development of some mines of good prospect lately set to work, amongst which Wheal Singer stands pre-eminent. Of this mine I will send you an account in a separate article, for insertion in the *Mining Journal*. The mine contiguous to this at the east (New Great Wheal Vor), having Wheal Singer's lodes, is very kindly. An engine-house was erected there about a year ago, but as yet no engine is placed in it. North Metal, south-east of Singer, is very slightly worked. They have there a rotary-engine for pumping and stamping, and a few men sinking a shaft on a lode—one of Wheal Vor lodes; but which they know not, because they do not know how the cross-course between their shaft and Wheal Vor has affected the lodes. It cannot be ascertained before development.

Truro, Aug. 18. R. SYMONS.

COOK'S KITCHEN MINE.

SIR,—About four years ago I caused to be inserted in your Journal a letter referring to Cook's Kitchen Mine, in which I said that a very long period had elapsed since the shareholders had received a dividend. A large shareholder—a sanguine miner—in reply, said that, without doubt, dividends would be resumed early in 1881. The prophecy has not been fulfilled, and we are now in August, 1884. The announcement of a dividend here would afford pleasure to me, although an outsider.—*Aug.* 18. R. SYMONS.

P.S.—Since writing the above I find that, at a meeting of the shareholders held on Friday last, the debit balance was 12,714*l.*, when a call of 2*l.* per share (4900*l.*) was made, to be paid by two instalments of 1*l.* each.—R. S.

VAN MINING COMPANY.

SIR,—The report of the share market in last week's *Mining Journal* contains the following notice of the Van Mine:—"It is understood that the shareholders, having approved the scheme submitted to them for raising fresh capital, the new company will be registered in the course of a few days, and operations resumed at Edward's shaft." I hope, Sir, you have been misinformed on this last point. Considering all that took place at the meetings which culminated in the liquidation of the old company, I think it will be wise for the liquidators to suspend all work at the mine till after the first statutory meeting of the new company has been held, at which the Articles of Association will have to be confirmed, and a board of directors formed. At this meeting it is fair to assume the liquidators will fully explain to the shareholders the present state of the mine, its prospects, and the grounds on which are based their opinions as to these prospects, the proposed plan for future operations, and the reasons of adopting this plan. This will enable the shareholders present to discuss the plan and make suggestions as to the future management of their property Had the fresh capital been raised without the liquidation of the old company I should have proposed that before any more work was done at the mine the directors should call to their assistance a committee of the shareholders to inspect the mine, and determine on what points operations should be undertaken, and from what was said by the directors at the meeting held July 25, I have no doubt the proposal would have been acceded to.

The fact that liquidation of the old company has been the course adopted for bringing in fresh capital has in no way lessened the advantage of the step I have recommended; indeed has rather increased it. From what I saw on a visit to the mine a month ago I have great doubts whether it is advisable to continue sinking Edwards' shaft, at least for the present; and other shareholders better acquainted with the mine than I am may have other suggestions to make well worth the consideration of the directors. If judiciously expended 7500*l.* should be amply sufficient to make a thorough exploration of the present bottom of the mine, but that sum will soon melt away if work not absolutely necessary for this purpose is undertaken. The Van Mine has now entered on its second infancy, and must be treated with care and gentleness, and not like a robust adult paying 50,000*l.* a year in dividends. I trust the shareholders in the new company will act as vigilant guardians over the neophyte.—*Aug.* 18. W. H. GATTI.

AMALGAMATING MACHINERY.

SIR,—In last week's *Mining Journal* I observe a description of an amalgamating or rather grinding machine, by a namesake of my own, at a meeting of mining engineers at St. Aubyn, which so closely resembles that invented and patented in 1853 by my partner, the late John Mitchell, of Dunning's-alley (author of the well-known Manual of Practical Assaying), as to appear a most remarkable instance of the same idea occuring to two individuals. The only differences I can find between the Thompson and Mitchell machines are the use of discs in the former in place of cones in the latter, the introduction of removable steel facings to the inner grinding surface of the pan, and an increased speed in working.

The cones in Mitchell's machine worked admirably in resisting the centrifugal motion of the balls, and communicating a spinning as well as rolling motion, by which the spherical shape was retained, and the grinding action against the sides of the pan considerably augmented. The discs in Thompson's machine will probably produce the same effect. The removable steel facings appear to be an improvement, as I found the greatest wear took place on the sides of the pan, that on the balls being very trifling—only 4 lbs. on balls of 125 lbs. weight after 12 months' almost constant work in Valparaiso.

The increase of speed is probably the most important feature in the new machine. Mitchell's worked at from 40 to 60, while this one goes at the rate of 400 revolutions per minute, which must of course greatly increase its grinding capacity; but the Mitchell machine acted as an amalgamator as well as a grinder, the ore being crushed in mercury, and gave excellent results. This is impracticable with the new machine, working at such a high speed, as the mercury would be thrown out with the tailings; but if the grinding accomplishes all that is claimed it is all that can be desired in this respect, and Moon's amalgamator will perform the rest of the operation, assuming that machine will work as satisfactorily as is advertised by the patentee and his friends. A test trial of a few hundred tons of ore by parties unconnected with either patent would, however, set the question at rest, and if successful be a source of immense satisfaction to the gold mining community. W. T. RICKARD, F.C.S.

Forest Hill, Aug. 20.

BICKTON MINE.

SIR,—Since the insertion of my letter in the *Mining Journal* of July 26, I have paid another visit to it, and found that they could not keep the water-wheel by which their pumping machinery is driven at work for want of surface water; so that further bears out my remark in my last letter, that they must put a good engine on the mine to work it successfully; and, perhaps, Mr. Editor, I might be allowed to suggest where, in my judgment, is the most suitable place in the sett, and, I think, the most economical. Now, I would suggest that they should put it up at the head of the hill, in Scrawdon Wood, adjoining the road that divides the sett, having that part of the sett which is in Mr. Clark's land on the north of it, and then it would only take a short run of flat-rods to run down to the present workings and the engine-shaft, and could be easily and economically connected to the present machinery, which is, I think, quite capable of keeping the mine dry to a great depth; and, besides this, by putting the engine where I have indicated, there is a shaft at the same place several fathoms deep, that might be sunk with advantage in working and opening up the northern part of the sett in Mr. Clarke's right. And, further than that, coal could be put into the engine-yard much more easier, for I consider that a wagon or

wagons would bring 3 tons to 2 more in a day from Tokenbury Corner than they would if they had to take it down around to the present working-shaft if an engine should be put there; and I strongly advise that it should be done forthwith, and then there would be no more dread or fear of a dry season. And my firm opinion is, that the sett is well worthy of a fair trial, seeing the splendid lodes that have been laid open at the surface.

I did not say much about their new copper lode which they have opened upon during the last few months; but I can assure you, Mr. Editor, it is a very promising one indeed. I think it was discovered first back in the very westernmost part of the sett, near their reservoirs. It is, I should think, nearly 4 ft. in width, and consists of a soft spar, mundic in large quantities, that is, for the depth, some splendid spots of yellow and grey copper ores, ruby, blende, and in a beautiful gossan, and the walls particularly well-defined, and showing an underlie of about 2 ft. 3 in. in a fathom. Now they have opened along upon this lode nearly on to their great north and south lode, which they are working upon. Its underlie is north.

Now, Sir, if they had no other lodes in the sett than those two I think, as a practical miner, that the directors and the company would be justified in the putting in of a good engine, and, consequently, putting on many more men, and as a consequence to these a greater output would be the results, and good and profitable returns made to them for their outlay would be the result, and beside the good to the community and the district at large. Now, I and other workers that I can answer for are quite ready as soon as there are any tribute pitches opened up in the bottom levels to take them, and I am certain that we can get wages too—that is, if the water is kept out of the mine, barring that everything is favourable for tributing, and I have not the least doubt but that large returns of silver-lead will be made when tribute pitches are let, and now that lead has made a start upward I think it strengthens my opinion that Bicton will, when properly and legitimately worked, be a first-class investment. There are several tons of dressed and undressed ores on the floors now, and I should judge the undressed to contain a high percentage for silver, and would, therefore, require very little but careful dressing before being sold and ready for the market.

Pensilver, Aug. 20. W. H.

ANGRA PEQUENA.

[TO THE EDITOR OF THE TIMES.]

SIR,—Twenty years ago Capt. Spence, of the firm of De Pass, Spence, and Co., of Cape Town, purchased of the principal chief of the district a tract of territory commencing at and including Angra Pequena Harbour, and extending 150 miles south, along the West African Coast, and 50 miles inland. The intention of the purchaser was to extract from the soil copper ore, which exists in large quantities; but owing to the want of water, operations were abandoned. Capt. Spence has held the territory, has sent his vessels regularly along the coast to trade with the natives, his rights have been recognised, and his claims have not been disputed. Recently a German firm purchased of a chief who was not, however, the principal chief, the harbour of Angra Pequena, the firm took possession, exercised Imperial rights, and even demanded dues from Capt. Spence's vessels when landing goods in the harbour. The masters of the vessels were instructed not to comply with the demands of the Germans, as the place belonged to their employer and owner. This statement I had from Capt. Spence when spending a short time with him in January last at his residence near Cape Town. From subsequent conversation, the impression left on my mind was that Capt. Spence thought the territory of slight value, because of the continued drought, but at the same time he looked upon the tract of land, including the harbour, as his, and the Germans as intruders.

What may have happened since I left the Cape I know not, but as claims of 20 years' standing existed, it seems unreasonable of the Germans to rouse themselves to such frenzy, as the Cologne Gazette and other journals are doing over this matter. Had the case been reversed, and an Englishman had purchased from a chief, who had no power to sell, part of a territory over which a German firm had held undisturbed possession for 20 years, there might have been cause for the exhibition of part of the indignation now exhibited by the German Press, and, if report speaks correctly, by Prince Bismarck himself.—*Aug.* 20. C. S.

CORNISH MINING.

SIR,—The inventions which have been made in machinery and appurtenances of late years have undoubtedly contributed to the continuation and prolongation of Cornish mines, and it is incontrovertably true that inventions, improvements, and alterations have to be made in order to make mining more profitable, or to use our (the miners') own parlance, "to keep pace with the times," and with foreign competition. The fact that Cornish mining has been remunerative to investors when honestly, legitimately, and judiciously performed, proves a stimulus to *bona fide* speculators, and when we consider the number of lodes, the amount of unwrought ground, the many mining setts in our county which are at present laying intact, awaiting the formation of companies and the appropriation of capital to develope its hidden treasures, we cannot refrain from forming any other conclusion that the county to which Cornishmen, wherever they may be located, feel so much attached will probably again be privileged with many profitably productive mines to afford employment for its inhabitants, and to give remuneration sufficient to enable miners to provide for and support their families respectably.

The inventions of useful appliances, so that mining in some departments may be performed with more dispatch, must be admitted as being a link or factor towards assisting the progression of the industry. Time under all circumstances in mining pursuits should be considered and valued as the intrinsic capital of the company. The old adage that time is money ought not to be obliterated from the memory. It is regretted that some companies prefer to work their mines on the sleepy or dwindling principle. There are mines working on this system whose prospects are encouraging, and everything that can be desired as far as appearances and indications are concerned. This principle of working is more commonly called by practical men "murdering time and spending money." A French philosopher once said that when we decide to work an enterprise let it be done with haste and activity.

That alterations in the mining industry should be made is almost the universal opinion of "One and All." Hitherto there has been little or nothing done towards reforming our mining laws; evidently there is no class in existence that stands in need of alterations more so than the mining community. A change in the laws relating to mining is much desired and undoubted.

In foreign countries dues are paid on profits only, and why should the people connected with mining in this country be deprived of the privileges which the foreigner have in other countries. In France 10 per cent. off profits is paid; in Germany, if I mistake not, 5 per per cent. off profits; in America mines are simply taxed like other descriptions of property, and no dues are paid either to landowners or the Government. In this country mines pay dues, rents, poor rates, highway rates, school rates, income tax; land destroyed, or used for mining purposes, has to be paid for at an extreme rate, in some cases 100*l.* per acre and more. S. J. VINCENT.

Chesterwring, Aug. 20.

COPPER MINING COMPANIES.

SIR,—I can make every allowance for the vexed feelings of a large shareholder in the Panulcillo Company who received the post-card which was sent out the other day giving the earnings of the company as only 1500*l.*, as against 18,500*l.* in the corresponding period of 1883. The fall in the price of copper lead everyone interested in this class of property to expect a diminution on the profits, but not to such an extent as that suddenly revealed by the post-card. As I am only a small holder I can view with comparative equanimity the serious decline in values, and if the shares should fall I should certainly become a purchaser. The Panulcillo is an excellent property, well managed by an efficient board of directors in London, and when the value of copper improves the price of the shares will respond as it did two or three years ago. L. W.

Old Broad-street, Aug. 21.

COPPER MINING SHARES.

SIR,—Your corespondent, "An Old Investor," is naturally angry at the action of the Spanish companies, which has had the effect of permanently lowering the price of copper. But he is wrong in supposing that all the copper companies are suffering to an equal extent. The Copiapo Company, a Chilian undertaking, with a capital of 175,000*l.*, has earned during the past six months 4800*l.*, which, added to 7009*l.* earned in the six months ending December, 1883, and the balance of 1254*l.* brought from the last year's accounts, will make an available total of 13,054*l.*, or over 73·8 per cent. on the capital. Assuming that the landed estate owned by the company yields only the small revenue earned last year it should cover the London office charges, and we may, therefore, expect a dividend of 7 per cent. next November.

The Copiapo Company pays regularly small quarterly dividends of about 6 per cent. on the capital. The remittances from the mine, published monthly in the *Mining Journal*, shows that this distribution will be maintained. Another dividend of 1s. per share is due next month, and a final dividend of 2s. for the financial year, which ends in June, may be expected in November next. The Copiapo Company does not smelt, but only sells its ores. J. Y.

Great Winchester-street, Aug. 21.

FOREIGN MINING AND METALLURGY.

The condition of the Iron Trade in the French Department of the Nord shows little alteration, except that prices have shown rather more firmness. Some blast-furnaces have been blown out, but iron-masters have refused to make any reductions in quotations. The Firminy Company has just obtained an order for 200 wheels from the Western of France Railway Company; the contract price is 15*l.* 10s. per ton, delivered at Paris. The quantity of Bessemer steel produced in the Department of the Nord last year is officially returned at 88,781 tons. The corresponding production in 1882 was 61,493 tons. There has been less activity in the iron trade of the West of Germany. In the Rhenish provinces a severe competition has prevailed of late in pig. No. 1 casting pig has brought 3*l.* 4s. to 3*l.* 6s. per ton at Dortmund. There has been some falling off in the production of puddling pig in Silesia. The average half-yearly production is 180,000 tons, according to the statistics of the last five years; during the first half of this year this rate of production has, however, been much exceeded. The production of Thomas pig has moved on as follows in Germany this year:—January, 33,459 tons; February, 29,420 tons; March, 40,815 tons; April, 46,276 tons; May, 40,685 tons; and June, 134,767 tons.

The stocks of pig on hand at the Belgian blast-furnaces are stated to be still heavy. The Belgian ironworks, as a whole, have orders in course of execution which will still keep them employed for some little time. The large establishments are, however, the best off for orders; some of the smaller ones are not so well favoured, and may even find it necessary to suspend their working operations. The great mechanical establishments of the Hainaut have obtained some orders for plant required for the Belgian State Railways, and their position has been proportionately improved. The result of an adjudication for 1500 trucks required for the Panama Canal Company is awaited with some interest in Belgium, most of the Belgian mechanical works having submitted tenders. The John Cockerill Company has carried off a rather considerable order for wheels required for the Roumanian State Railways. The tender submitted by the John Cockerill Company in connection with this affair was much lower than the proposals made respecting it by German works. English casting pig has made 2*l.* 2s. 6d. per ton upon the Belgian markets. No. 1 iron has continued to be quoted in Belgium at 4*l.* 10s. per ton for exportation.

Opinions appear to differ to some extent as to the prospects of the Belgian Coal Trade; meanwhile the main features of the market may be said to be a relative firmness in the demand for household coal, and weakness in the industrial coal. In the Couchant de Mons prices have been generally well supported. The Colliery Union of that district has addressed itself to the Belgian Railway Department with the view of obtaining the immediate application of a new tariff for the conveyance of combustibles to the East of France, *via* Givet and Vireux. This tariff is the result of a convention concluded recently between the Great Central Belgian Railway and the administration of the Belgian State lines. The production of the collieries of the French Department of the Nord amounted last year to 3,789,067 tons, showing an increase of 11,437 tons, as compared with the corresponding production of 1882. The largest share of the coal production of the Nord is effected by the Anzin Mines. The number of persons engaged in coal mining in the Nord in 1883 was 19,880, as compared with 20,058 in 1882. There has been rather more activity observable of late in the German coal trade. The quantity of coal which arrived at Berlin in the first half of this year was 592,829 tons; lignites also arrived to the extent of 225,775 tons. The extraction of the Sarrebruck mines in July was 509,665 tons, as compared with 418,042 tons in July, 1883.

RAILWAY TARIFFS—ADVANTAGE OF REDUCED RATES.—It has frequently been urged that the lower the rate charged (within certain limits of course) by railway companies for the carriage of minerals and merchandise, the greater are the chances of the railway company continuing to earn profits. This is confirmed by some figures given in the Bulletin of the American Iron and Steel Association. The subjoined table prepared by an officer of the Pennsylvania Railroad Company shows the enormous growth of the freight business of that company since 1865, when 420,060,260 tons of freight were carried 1 mile, while in 1883 there were carried 2,996,892,567 tons 1 mile. In 1865 the cost per ton per mile for transportation was 2·665 cents, which in 1883 had decreased to 0·819 cents per ton per mile. A calculation, computed on the rate of 1865 as compared with that of 1883, shows a total reduction or saving for the 18 years of $438,270,113. It should be remembered, too, that the service of to-day is far superior to that of the period prior to the war, while the cost has been reduced to less than one-third that of a score of years ago—

Years.	Total tons one mile.	Average rate per ton per mile.	Amount of reduction each year, computed on rate of 1865.
1865.....	420,060,260	2·665	
1866.....	513,102,181	2·282	$ 1,965,181
1867.....	565,675,813	2·092	3,241,219
1868.....	675,775,560	1·906	5,129,137
1869.....	752,711,312	1·718	7,128,176
1870.....	825,979,682	1·549	9,217,933
1871.....	1,011,892,207	1·389	12,911,745
1872.....	1,190,144,036	1·416	14,864,899
1873.....	1,384,831,970	1·416	17,296,551
1874.....	1,372,566,976	1·255	19,353,194
1875.....	1,479,414,466	1·058	23,774,191
1876.....	1,629,742,021	0·892	28,895,326
1877.....	1,494,798,198	0·980	25,187,350
1878.....	1,732,003,131	0·918	30,258,095
1879.....	2,136,708,887	0·796	39,935,089
1880.....	2,298,317,323	0·880	41,024,964
1881.....	2,655,438,764	0·799	49,550,487
1882.....	2,879,542,701	0·817	53,213,949
1883.....	2,996,892,567	0·819	55,322,637
Total reduction for 18 years			$438,270,123

Notwithanding the great reduction in the cost of carrying, the company has been able to get a fair remuneration for the service rendered.

HOLLOWAY'S OINTMENT.—Sores, wounds, ulcerations, and other diseases affecting the skin, are amendable by this cooling and healing ointment. It has called forth the loudest praise from persons who have suffered for years from bad legs, abscesses, and chronic ulcers, after every hope of cure has long passed away. None but those who have experienced the soothing effects of this Ointment can form an idea of the comfort it bestows, by restraining inflammation and allaying pain. Whenever this ointment has been once used, it has established its own worth, and has again been eagerly sought for, as the easiest and safest remedy for all ulcerous complaints. In neuralgia, rheumatism, and gout the same application, properly used, gives wonderful relief.

MINERAL RESOURCES OF THE FOREST OF DEAN.

Some interesting remarks with regard to the resources of the Forest of Dean were made at the half-yearly gale-rent audit, held at the Speech House, on Tuesday, when Mr. T. FOSTER BROWN, the deputy-gaveller representing the Crown authorities, presided. The business of the audit having been satisfactorily concluded, dinner was served in the old Court-room; and the usual loyal toasts having been drunk, the PRESIDENT, in proposing "Success to the Coal and Iron Industries of the Forest," observed that it was unfortunate that every half-year it did not seem that the coal and iron trades of the Forest of Dean became much more prosperous, and, in fact, there appeared to be no further development of either coal or iron mines. He was afraid that as time went on without some change that they would have to face a worse condition of the coal trade, mainly due to the exhaustion or the reduction of the existing collieries, and have to turn their attention to the working of the thicker and more expensive seams. They could not have any permanent and general prosperity, to the district without a much larger development. In order to have what might be called prosperous times they must all, as times went on and circumstance allowed, endeavour to further that development which was required. The subject was a vexed one, and it was not opportune or desirable that it should be discussed on occasions of that kind, and he would only leave it with the hope that they might see such a combination of capitalists and other interests as would tend to the further development of both the coal and iron interests of the Forest.

The responses to the toast were by no means so encouraging as could be wished, but the question is whether those concerns are applying their energy in the right direction to bring about an improvement. With the toast referred to the names of Mr. Phillips, of Dowlais, for the iron industry, and Mr. Deakin, of Parkend, for the coal trade. The iron trade of the Forest seemed to Mr. PHILLIPS to be almost a thing of the past. Whether it would ever improve again he did not know. He believed at one of their recent audits a gentleman, speaking of the Forest of Dean iron trade, said he had yet hope of seeing a revival. He (Mr. Phillips) should like to see it. At present they had a great competition in regard to steel. Steel appeared to be everything; iron was almost gone, and this rivalry was depressing them most severely; but he hoped to see the day when they should have a reminder of the old days. As to the coal trade, Mr. DEAKIN said that he hoped it had not disappeared from the Forest of Dean, as the iron trade appeared to have done. The coal trade of the Forest was a question of who should do it, and for some years the quantity raised had been pretty equally divided. The future of the Forest coal trade was not gone. The Forest house coal was a very good coal, and the steam coal was very good if they could get at it, and that was a question that must be looked at some day in the future. As the Chairman had said, if the Forest was to maintain its position, sooner or later these coals must be reached. Heaven help the man who went down first, but no doubt he would be helped by others. The western side of the Forest seemed to have had a hard time of it. All the trade seemed to have gone to the other side; but at the same time he believed that, by all pulling together, they would keep a portion of the trade in their hands. They had no reason to be ashamed of their coal, for the Thin coal of the Forest was as good as any raised in England. The material was there; the thing was to work it.

Amongst the several other toasts proposed and responded to was one—"The Health of the Crown Officer"—which merits special record; it was neatly proposed by Mr. WHEATLEY, and the DEPUTY-GAVELLER, in responding, referred to the cordial feeling that had always prevailed at those gatherings as an indication that although they represented different opinions and conflicting interests, the galees believed they were animated with a desire to do their duty to all parties.

SCIENTIFIC MISTAKES CONCERNING NEW SOUTH WALES.—Alluding to mistakes made by scientific writers when touching on the subject of Australian weather, Mr. H. C. Russell, the Government Astronomer of New South Wales, says:—"It is a fact that in works of reference Australia is generally credited with heat in excess of that due to its latitude. It is difficult to say why, unless it arose from a habit of one of our early explorers who carried a thermometer, and carefully published all the high readings he got, until, fortunately for the colony, the instrument was broken and the unfair register stopped. But not only the interior, Sydney, even to the present day, is credited, in standard works of reference, with a mean temperature of 66·2°, or nearly 4° higher than the true mean, which is 62·6°. Such an error is not excusable when meteorological observations have been taken and published for just 40 years. There is another error made by some writers when describing Australia. It is shown by them inverted on the corresponding latitudes in Europe, and the reader naturally infers that Australia is as hot as those parts of Europe. Such is not the case. Confining our attention to New South Wales—that is, between 29° and 37° of south latitude—we find that generally it is cooler than a corresponding part of Europe. The mean temperature of the southern parts of England is about 52°, and that of France, near Paris, about the same, increasing as you go south to 58·5° at Marseilles. Taking this as a sample of the best part of Europe, let us see how the mean temperature in the colony compare with those:—Kiandra, our coldest township, situated on a mountain, is 45°; Cooma, on the high land, 52°; Queanbeyan, high land, 53°; Goulburn, high land, 55°; Armidale and New England district, 57°; Mossvale, 55°; Kurrajong, 55°; Orange, 55°. These towns are scattered along the high table lands from south to north, and represent fairly the climate of a very considerable portion of the whole colony. Next to this in point of temperature is the strip of land between the ocean and the mountains, and which is affected by the cooling sea breezes. Here we have a mean temperature ranging from 60° at Eden the most southern port, to 68° at Grafton, one of the northern ports. Sydney, in latitude 34°, has a summer temperature only 4° warmer than Paris, which is in latitude 49°. Now, the usual difference for a degree in latitude is a degree in temperature, and, therefore, if Sydney were as much warmer than Paris as its latitude alone would lead us to expect, its temperature should be 74°, that is 15° warmer than Paris, but as we have seen it is only 4° warmer. This single example is enough to prove the comparative coolness of our coast districts. The investigations made during recent years show that the mean temperature of the whole Colony, as derived from 45 stations scattered over it, is 59·5° three degrees lower than that of Sydney, or only one degree hotter than that of Paris. It may be mentioned that the highest shade temperature ever recorded in Sydney was 106·9°, and near Paris a temperature of 106·5° has been recorded."

THE NEW PHYSICS.—Under this title Prof. John Trowbridge, of Harvard University, has written a new text book for schools, which is in preparation by Messrs. D. Appleton and Co. It is stated that it admirably carries out the principles of the new education, in requiring the pupil to become familiar with the properties of matter and the phenomena of force by performing experiments for himself.

GLASS COATING ON METALS.—For coating metallic surfaces with glass it has been suggested to take about 125 parts (by weight) of ordinary flint-glass fragments, 20 parts of carbonate of soda, and 12 parts of boracic acid, and melt. Pour the fused mass out on some cold surface, as of stone or metal, and pulverise when cooled off. Make a mixture of this powder with silicate of soda of 50° B. With this coat the metal to be glazed, and heated in a muffle or other furnace until it is fused. The coating is said to adhere very firmly to steel or iron.

ZINC ENAMEL.—Calcine 100 parts lead and 20 to 30 parts of tin thoroughly. Melt 100 parts of this mixture with 100 of white sand, and 25 or 30 parts salt. When cool pulverise very finely. This gives a dead white enamel for the ground. The black can be formed by the addition of black oxide of manganese or protoxide of iron. Apply to metal in form of a paste, in water to which a little glue has been added, and fire.

MINING IN DERBYSHIRE UNDER THE DERBYSHIRE MINING CUSTOMS AND MINERAL COURTS ACT OF 1852.

No. III.—By W. Niness, M.E.

The above-named Act is divided into two divisions—the first division of the Act is to define, alter, and amend the mineral customs; and the second division to make better provision for the better administration of justice in the Barmote Courts within the jurisdiction of the Act. The latter division contains 68 clauses. It will not be necessary to give the whole of them; but I consider the following clauses abbreviated, and extracts from others, requisite to thoroughly comprehend the meaning of both divisions of the Act and its advantages:—

Clause III. makes it lawful for the Queen and her successors to nominate and appoint from time to time, by Letter Patent under the seal of the Duchy of Lancaster, a fit and proper person, being a barrister-at-law of five years' standing, or a member of one of the Inns at Court, who has practised as a special pleader for ten years, or an attorney or solicitor of some of the superior courts of law or equity at Westminster of seven years' standing, to be and to be called the "Steward of Wirksworth Barmote Courts," such steward to hold office during the will and pleasure of the Queen and her successors. The steward is the chief judicial officer appointed under the Act, according to Manlove, who wrote in 1649, at which time the office was a permanent institution. His office was an usurpation of duties originally belonging to the office of the barmaster, as formerly the latter presided in the barmote courts to decide upon the miners' causes. When such causes involved important issues or large sums of money, it was usual for the Crown to call in some person of the legal profession well versed in the mineral customs to act as judge or arbitrator, though nominally assistant only to the barmaster. Afterwards stewards were appointed during the farmer's pleasure, and ultimately the office became permanent.

Clause IV. entitles the respective persons for the time being to the first estate of freehold in the mineral duties respectively payable within the several manors or liberties of Ashford, Hartington, Peak Forest, Tideswell, Stoney Middleton and Eyam, Youlgreave, and Litton, to appoint qualified persons, provided with respect to the steward appointed by the Queen to act as stewards for the aforesaid manor or liberties respectively. When several manors are united in one liberty for the purposes of the Act, one steward only to be appointed for each united liberty.

Clause VI. makes it lawful for the persons entitled to the first estate of freehold in the mineral dnties of the manor or liberty of Crich to appoint a separate steward for the said manor or liberty.

Clause VII. gives power to appoint one person as steward to several courts.

Clause IX.—Lawful for the steward to appoint a deputy steward qualified to act for him at any time when prevented, such deputy while acting shall have the like powers and privileges, and be subject to like provisions, duties, and penalties for misbehaviour as if he were the steward for the time being.

Clause X.—Duties of steward to receive and enter plaints in a book to be kept by him for that purpose; issue summonses; hold and preside at the great and small barmote courts; issue precepts under his hand to the barmaster for summoning attendance of grand jury or views, and at the great barmote courts, also precepts to barmaster for summoning and impannelling jurors for trials of causes at small barmote courts; administer oaths to barmasters, jurors, witnesses, or other persons at and out of great and small barmote courts; tax costs in all cases where, by this Act, costs are or may be given; attend and preside at views; sign and issue subpœnas for summoning witnesses, and the process of courts, both mense and final, and all rules and orders of the courts, and warrants for enforcing the judgments of the courts, levying penalties; make returns to writs of *certiorari*; advise the barmasters and grand juries and other juries upon matters of law and all other matters connected with their respective duties; affix the seal of the barmote courts to such documents as require the same; hear and determine applications to the courts which do not require the intervention of a jury, to make orders thereon upon such terms as to payment of costs by either party, or otherwise, as may to him seem just; keep verdicts, judgments, books, and proceedings of great and small barmote courts, and the seal of the said courts, and also all books hereinafter provided to be kept and delivered to the steward by the barmaster safe and in good condition, and to deliver up the same to his successor whenever required.

Clauses XI., XII., XIII., XIV., and XV. are as to the holding of barmote courts, two of which to be held within the soke and wapentake of Wirksworth, at Wirksworth, one within a month next after the 25th of March and the other within a month next after the 29th of September. Small barmote courts to be held in the said soke and wapentake and manors or liberties respectively from time to time as required. The great and small barmote courts for the said manors or liberties to be held at any place within the jurisdiction of the courts appointed by the steward. The following manors or liberties—Ashford, Tideswell, Peak Forest, and Hartington to be united to form one liberty, and the manors Stoney Middleton and Eyam one for holding great and small barmote courts; one great barmote court to be held every year for each of the said united manors or liberties. One or more great barmote courts to be held at the respective stewards' discretion within the manor of Litton and the manor or liberty of Youlgreave respectively.

Clause XVI.—Business at great barmote courts, the swearing in of the grand jury, and such other matters are in this Act mentioned as being matters to be transacted at the great barmote courts. Matters to be transacted at the small barmote courts, the trials of actions of title, trespass, and debt, and such other matters as related in the Act.

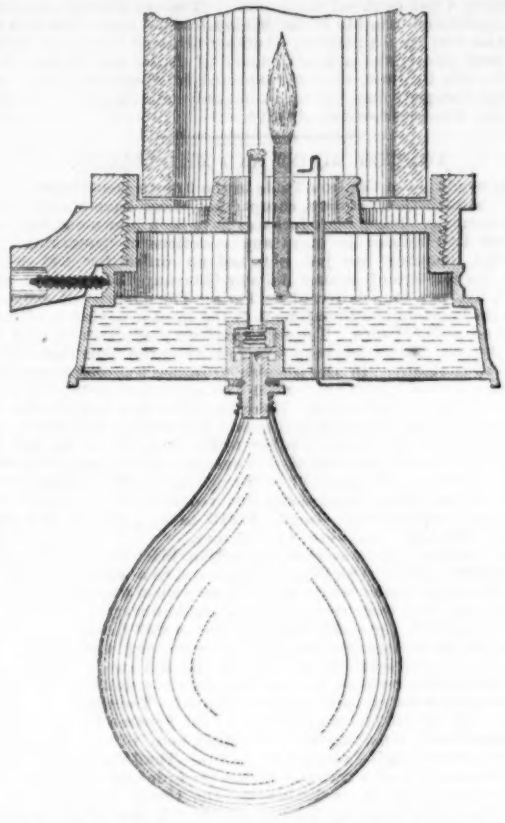
The frequency of the barmote courts being held and the several places in which they are appointed to be held by the foregoing clauses within the jurisdiction of the Act are advantageous to the miners, and in many cases the means of saving the miners both time and money with reference to the cases under consideration at the courts; but I cannot understand how the Act does not allow the working miners' expenses when called upon to comprise the juries for the barmote courts. A good tuck out in the shape of a free dinner on such occasions is good in its place, but I think the miners are justly entitled to their travelling expenses and fair remuneration for their time.

Clause XVII.—A seal or a stamp to be provided by the steward with words thereon specifying the particular court of which it is the seal; all proceedings in the great and small barmote courts required to be signed by the steward to be sealed and stamped therewith.

Gazetteer of the County of Cornwall.—This work, composed by an old correspondent of the *Mining Journal*, Mr. R. Symons, of Truro, being out of the press, will shortly be published, with a list of the subscribers. It is a work unique of its kind, there being nothing like it extant. It begins with a historical preface, then follows an alphabetical list and description of parishes, townships, Ecclesiastical districts, noblemen's and gentlemen's seats, villas, villages, hamlets, farms, churches, chapels, &c., then a glossary of mining terms mostly in use in the Cornish mining districts. Next, mining in Cornwall, an alphabetical list of mines in Cornwall, the most prominent promoters of mining in Cornwall in recent times, mines which have given dividends, progressive mines, notes on mines, tin ore obtained from refuse flowing into rivers, &c., Red River stream works, stream works on Wheal Basset stream, other stream works, list of tin and copper ore smelters, china clay and china stone works, chief Cornish literary characters, remarkable characters, canals, railways, rivers, lakes, altitude of hills, and other eminences, longevity of some Cornish people, geography of Cornwall, divisions of Cornwall, trade and agriculture, dukedom of Cornwall, list of hundreds and parishes, geology of Cornwall by Mr. Brenton Symons, C.E., F.C.S., with parochial and geological maps of the county. Such a work as this will supply a deficiency in all libraries, and is, therefore, commended to the attention of all classes of readers. See advertisement on page 900. Notice of the geology will be given in a future Journal

IMPROVED FIRE-DAMP DETECTOR.

An ingenious invention, the object of which is to detect fire-damp in collieries with the least possible risk to those engaged in the work, has been introduced by Mr. W. E. Garforth, M.E., of Normanton. The invention, which is really an improved method of bringing to a safety the air to be tested, is claimed to be equally applicable to all descriptions of existing lamps. Consequently it is of additional value, as it will not interfere with the several improvements which have been made with safety-lamps during the last few years, and which have been found necessary to meet the requirements of modern mining, consequent on the increased depth at which coal has now to be won. Mr. Garforth's invention, which is illustrated in the subjoined diagram, for the engraving of which we are indebted to the Colliery Guardian, consists in the use of a small india-rubber hand ball without a valve



of any description, but by the ordinary action of compressing the ball and then allowing it to expand a sample of the suspected atmosphere is drawn from the roof or any part of the mine, without the great risk which now attends the operation of testing for gas should the gauze be defective. The sample thus obtained is then forced through a small protected tube on to the flame, when if gas is present it is shown by the well-known blue cap and elongated flame. From this description and from the fact that the ball is so small that it can be carried in the coat pocket, or, if necessary, waistcoat pocket, it will be apparent what a valuable adjunct Mr. Garforth's invention will prove to the safety-lamp. It has been supposed by some persons that explosions have been caused by the fire-trier himself, but owing to his own death in most cases the cause has remained undiscovered. This danger will now be altogether avoided. It is well known that the favourite form of lamp with the firemen is the Davy, because it shows more readily the presence of small quantities of gas, but the Davy was some years ago condemned, and is now strictly prohibited in all Belgian and many English mines. Recent experience gained by repeated experiments with costly apparatus has resulted in not only proving the Davy and some other descriptions of lamps to be unsafe, but some of our Government Inspectors and our most experienced mining engineers go so far as to say "that no lamp in a strong current of explosive gas is safe unless protected by a tin shield." If such is the case Mr. Garforth seems to have struck the key-note when in the recent paper read before the Midland Institute of Mining and Civil Engineers, and which we have now before us, he says:—"It would seem from the foregoing remarks that in any existing safety-lamp where one qualification is increased another is proportionately reduced, so it is doubtful whether all the necessary requirements of sensitiveness, resistance to strong currents, satisfactory light, self extinction, perfect combustion, &c., can ever be combined in one lamp."

The nearest approach, says the Colliery Guardian, to Mr. Garforth's invention which we have ever heard of is that of a workman at a colliery in the North of England, who more than 20 years ago, to avoid the trouble of getting to the highest part of the roof, used a kind of air-pump, 7 ft. or 8 ft. long, to extract the gas from the breaks, and some five years ago Mr. Jones, of Ebbw Vale, had a similar idea. It appears these appliances were so cumbersome, besides requiring too great length or height for most mines, and necessitating the use of both hands, that they did not come into general use. The ideas, however, are totally different, and the causes which have most likely led to the invention of the ball and protected tube were probably never thought of until recently; indeed, Mr. Garforth writes that he has only learnt about them since his paper was read before the Midland Institute, and some weeks after his patent was taken out.

No one, says Mr. Garforth, in his paper read before the Midland Institute, will, I presume, deny that the Davy is more sensitive than the tin shield lamp, inasmuch as in the former the surrounding atmosphere or explosive mixture has only one thickness of gauze to pass through, and that on a level with the flame, whilst the latter has a number of small holes and two or three thicknesses of gauze (according to the construction of the lamp), which the gas must penetrate before it reaches the flame. Moreover, the tin shield lamp, when inclined to one side, is extinguished (though not so easily as the Mueseler); and as the inlet holes are 6 in. from the top, it does not show a thin stratum of fire-damp near the roof as perceptibly as the Davy, which admits of being put in almost a horizontal position. Although the Davy lamp was, nearly fifty years ago, pronounced unsafe, by reason of its inability to resist at an ordinary velocity of 8 ft. per second, yet it is still kept in use on account of its sensitiveness. Its advocates maintain that a mine can be kept safer by using the Davy, which detects small quantities of gas, and thereby shows the real state of the mine, than by a lamp which, though able to resist a greater velocity, is not so sensitive, and consequently is apt to deceive. Assuming the Davy lamp to be condemned (as it has already been in Belgium and in some English mines), the Stephenson and some of the more recently invented lamps pronounced unsafe, then if greater shielding is recommended the question is—What means have we for detecting small quantities of fire-damp? It would seem from the foregoing remarks that in any existing safety-lamp, where one qualification is increased another is proportionately reduced, so it is doubtful whether all the necessary requirements of sensitiveness, resistance to strong currents, satisfactory light, self-extinction, perfect combustion, &c., can ever be combined in one lamp. The object of the present paper is to show that with the assistance of the fire-damp detector the tin shield (or any other description of lamp) is made as sensitive as the Davy, whilst its other advantages of resisting velocity, &c., are not in any way interfered with. As a proof of this I may mention that a deputy of experience recently visited a working place to make his inspection. He reported the stall to be free from gas, but when the manager and steward visited it with the detector, which they applied to a break in the roof (where it would have been difficult to put even a small Davy), it drew a sample of the atmosphere, which, on being put to the test tube in the tin shield lamp at once showed the presence of fire-damp. Out of 28 tests made in a mine working a longwall face the Davy showed gas only 11 times, whilst the detector showed it in every case. The detector, as will be perceived from the one exhibited, and the accompanying sectional drawing, consists simply of an oval-shaped india-rubber ball, fitted with a mouthpiece. The diameter is about 2¼ in. by 3 in., its weight is 2 ozs., and it is so small that it can be carried without any inconvenience in the coat or even in the waistcoat pocket. Its capacity is such that all the air within it may be expelled by the compression of one hand. The mouthpiece is made to fit a tube in the bottom of the lamp, and when pressed against the india-rubber ring on the ball-flange, a perfectly tight joint is made, which prevents the admission of any external air. The tube in the bottom of the lamp is carried within a short distance of the height of the wick-holder. It is covered at the upper end with gauze, besides being fitted with other thicknesses of gauze at certain distances within the tube; and if it be found desirable to further protect the flame against strong currents of air, a small valve can be placed at the inlet, as shown in the drawing. This valve is made of sufficient weight to resist the force of a strong current, and is only lifted from its seat by the pressure of the hand on the mouthpiece. It will be apparent from the small size and elasticity of the detector that the test can easily be made with one hand, and when the ball is allowed to expand a vacuum is formed within it, and a sample of the atmosphere drawn from the breaks, cavities, or highest part of the roof, or, of course, any portion of the mine. When the sample is forced through the tube near the flame, gas, if present, at once reveals itself by the elongation of the flame in the usual way, at the same time giving an additional proof by burning with a blue flame on the top of the test tube. If gas is not present the distinction is easily seen by the flame keeping the same size, but burning with somewhat greater brightness, owing to the increased quantity of oxygen forced upon it.

I venture to claim for this method of detecting fire-damp the following amongst other advantages:—(1.) The detector, on account of its size, can be placed in a break in the roof, where an ordinary lamp—even a small Davy—could not be put, and a pure sample of the suspected atmosphere is obtained than would be the case even a few inches below the level of the roof.—2. The obtaining and testing a sample in the manner above described takes away the possibility of an explosion, which might be the result if a lamp with a defective gauze were placed in an explosive atmosphere. No one knows how many explosions have not been caused by the fire-trier himself. This will now be avoided. (Although lamps fitted with a tin shield will be subjected to the same strict examination as hitherto, still they do not admit of the same frequent inspection as those without shields, for in the latter case each workman can examine his own lamp as an extra precaution, whereas the examination of the tin shield lamps will rest entirely with the lampman).—3. The lamp can be kept in a pure atmosphere whilst the sample is obtained by the detector, and at a greater height than the flame in a safety-lamp could be properly distinguished. The test can afterwards be made in a safe place, at some distance from the explosive atmosphere; and owing to the vacuum formed, the ball (without closing the mouthpiece) has been carried a mile or more without the gas escaping.—4. The detector supplies a better knowledge of the condition of the working places, especially in breaks and cavities in the roof, which latter, with the help of a nozzle and staff, may be reached to a height of 10 ft. or more, by the detector being pressed against the roof or sides, or by the use of a special form of detector.—5. Being able at will to force the contents of the detector on to the flame, the effects of an explosion inside the lamp need not be feared. (This danger being removed, admits, I think, of the glass cylinder being made of a larger diameter, whereby a better light is obtained; it may also be considered quite as strong, when used with the detector, as a lamp of a small diameter, when the latter is placed in an explosive atmosphere).—6. The use of the detector will permit the further protection of the present tin shield lamp, by an extra thickness of gauze, if such addition is found advantageous in resisting an increased velocity.—7. In the Mueseler, Stephenson, and other lamps, where the flame is surrounded by glass, there is no means of using the wire for shot firing. The detector tube, although protected by two thicknesses of gauze, admits of this being done by the use of a special form of valve turned by the mouthpiece of the detector. (The system of firing shots or using open lamps in the same pit where safety-lamps are used, is exceedingly objectionable; still, under certain conditions, shots may be fired without danger. Whether safety-lamps or candles are used, it is thought the use of the detector will afford such a ready means of testing that more examinations will be made before firing a shot, thereby ensuring greater safety.)—8. In testing for gas with a safety-lamp, there is a fear of the light being extinguished, when the lamp is suddenly placed in a quantity of gas, or in endeavouring to get a very small light; this is especially the case with some kinds of lamps. With the detector this is avoided, as a large flame can be used, which is considered by some a preferable means of testing for small quantities, and the test can be made without risk. Where gas is present in large quantities, the blue flame at the end of the test-tube will be found a further proof. This latter result is produced by the slightest compression of the ball. (I need not point out the inconvenience and loss of time in having to travel a mile or more to re-light.) As regards the use of the detector with open lights, several of the foregoing advantages or modifications of them will apply. Instead of having to use the safety-lamp as at present, it is thought that the working place will be more frequently examined, for a sample of the suspected atmosphere can be carried to a safe place, and forced on to the naked light, when, if gas be present, it simply burns at the end of the mouthpiece like an ordinary gas jet. There are other advantages, such as examining the return airways without exposing the lamp, &c., which will be apparent, and become of more or less importance, according to the conditions under which the tests are made. In conclusion, I wish to point out that the practice adopted at some collieries of having all the men supplied with the most approved lamp (such as the Mueseler or the tin shield lamp), except the deputies (who are supplied with the Davy), is not a safe one. If the strength of a chain is only equal to the weakest link, it may be argued that the safety of a mine is only equal to that of the most careless man, or most unsafe lamp in it. If, therefore, the deputies, whose duty it is to look for gas and travel the most dangerous parts of the mine, are obliged to use the Davy on account of its sensitiveness, may it not be said that as their lamps are exposed equally with the workmen's to the high velocities of air that they are the weak links in the safety of the mine? For the reasons given, I venture to submit that the difficulties and dangers I have mentioned will be largely reduced, if not wholly overcome, by the use of the firedamp detector.

Cornish Pumping-Engines.—The number of pumping-engines reported for July is 12. They have consumed 1197 tons of coal, and lifted 8·9 million tons of water 10 fms. high. The average duty of the whole is, therefore, 50,200,000 lbs. lifted 1 ft. high by the consumption of 112 lbs. of coal. The following engines have exceeded the average duty:—

Dolcoath—85 in.	Millions 63·1
Mellanear—Gundry's 80 in.	53·7
West Wheal Seton—Harvey's 85 in.	63·9
West Wheal Seton—Rule's 70 in.	66·5

Gold Miners in New South Wales.—The numbers of miners engaged in gold mining during the year, according to the returns furnished by the Mining Registrars, is 6750. Of these 5742 are Europeans and 1008 are Chinese. Taking the output of gold divided by the number of miners as indicating the average earnings of the miners we find that each miner earned 18·34 ozs. of gold, valued at 67*l.* 18s. 6-53d., for the year.

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This Crane lifts the specified weight with single chain and double gear.
The 7-ton size lifts its maximum load with double chain and double gear.

Price includes sufficient chain, with hook and ball, to reach ground level.

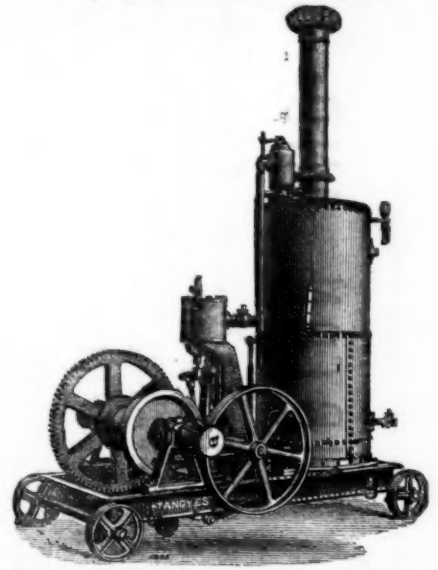
Tested to	Radius.	Price.	Steam self-propelling gear without load.	Canopy to protect driver.	Clips for rails per set.
2 tons.	16 ft.	£280	£40	£14	60/-
3 ,,	18 ,,	330	50	16	80/-
4 ,,	18 ,,	390	50	16	100/-
5 ,,	18 ,,	450	70	20	120/-
7 ,,	18 ,,	520	80	20	130/-

TANGYES' STATIONARY STEAM CRANE.

Price includes sufficient chain, with hook and ball, to reach ground level.

Tested to	Radius.	Price.	Canopy to protect driver.
2 tons.	16 ft.	£280	£14
3 ,,	16 ,,	330	16
4 ,,	18 ,,	385	16
5 ,,	18 ,,	440	20
7 ,,	18 ,,	510	20

TANGYES' PORTABLE STEAM HOISTING ENGINE.

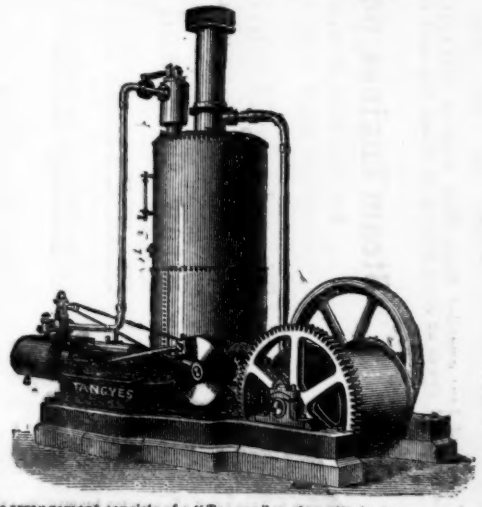


This engine will raise the specified weight at a speed of about 100 ft. per minute. It is fitted with link motion reversing gear, and friction brake. The hoisting barrel may be thrown out of gear. The engine and boiler are fixed on a wrought-iron carriage, which forms the tank for supplying the boiler with water. Either flanged wheels for rails or flat for ordinary roads can be supplied.

Tested to	Price.	Hoisting engine on cast-iron base, without feed pump, boiler, or wheels.	Warping barrels, extra.
12 cwts.	£135	£80	40/-
20 ,,	175	105	80/-

No governor supplied with these hoisting engines.

TANGYES' IMPROVED STEAM HOISTING ENGINE.



This arrangement consists of a "Tangye" engine with feed pump, spur pinion on the engine shaft, working into a spur wheel on the drum shaft, cast-iron drum, with shaft and carriages, foot-strap brake, and friction clutch, to throw the drum in and out of gear. The boiler has the necessary steam and furnace fittings. Described in catalogue. The whole is mounted on a cast-iron base.

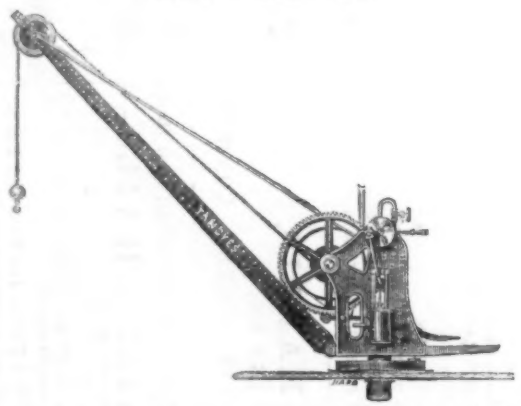
The winding drum can be thrown out of gear and the engine then used for driving purposes.

Diam. cylinder.	Length Stroke.	Speed rope per minute.	Tested.	Price.	Approx. weight.
6 in.	12 in.	200 ft.	7 cwts.	£140	65 cwts.
8 ,,	16 ,,	250 ,,	10 ,,	185	95 ,,
9 ,,	18 ,,	300 ,,	12 ,,	225	110 ,,

Link motion, reversing gear, extra.

TANGYES' FIXED STEAM CRANE

For Ships' Decks, Wharves, &c.

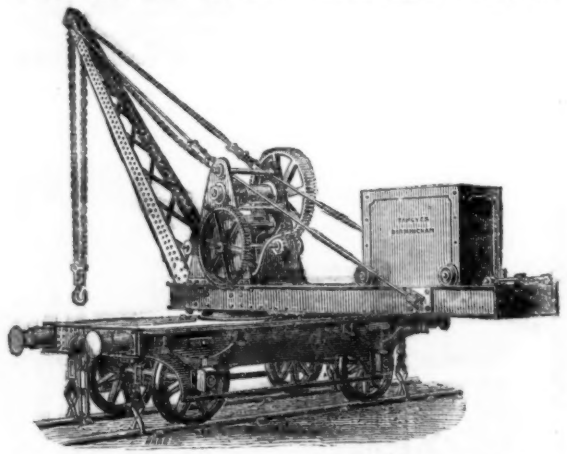


This Crane has two cylinders fixed on Crane Frames. The slewing is effected by friction clutches and spur gearing. The motion can be reversed by a simple throw of clutch handle. A powerful Foot Brake is provided for lowering. The Crane Post is a best hammered iron forging. The Engines work at 40 lbs. steam pressure, and lift the load with single chain and single purchase, except the three ton size, which has double purchase.

Prices includes sufficient chain, with hook and ball, to reach ground level.

Tested to ... ... tons	1	2	3
Radius ... ... ft.	15	15	15
Diam. Cylinder ... in.	5	6	7
Length Stroke ... ,,	9	10	10½
Weight, approx ... tons	3	4	5
Price ... ... £	135	155	200

TANGYES' POWERFUL RAILWAY ACCIDENT CRANE.



Mounted on strong wrought-iron carriage with wheels 3 ft. diam., 4 ft. 8½ in. gauge, and axle boxes; wrought-iron tail plates. Cast-iron balance box worked by screw with cast-iron tube to protect same. Lowering brake. Jib 16 ft. radius, to lower down entirely or fix at various angles without varying the position of the anti-friction pulley below. Snatch Block and sufficient Chain to reach ground and clips for rails.

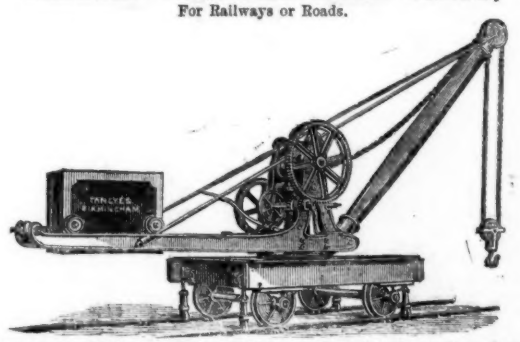
Tested to 5 tons Price...	£270
,, 10 ,, ,, ...	£365

This Crane can be made with pitch chain wheel or barrel as desired.

Our Patent Safety Brake, as described in catalogue, can be applied to above Crane at a slight extra cost. This Brake has the valuable property of safely sustaining the load when the men have left the handles.

TANGYES' PORTABLE HAND CRANE,

For Railways or Roads.



With single and double purchase lifting gear, powerful strap brake and lever, two winch handles, strong iron column and bed-plate, turned roller path, adjustable balance box, which may be regulated according to the weight raised, wood jib, sufficient chain with block to reach ground level, the whole mounted upon strong wood-framed travelling carriage, with four cast-iron wheels, with wrought-iron axles for rails of any gauge, sufficient to afford the necessary base for stability.

Tested to	Radius.	Price.	Clips, extra
12 cwts.	8 ft.	£31	30/-
1 ton	8 ,,	33	30/-
2 ,,	10 ,,	52	40/-
3 ,,	12 ,,	78	50/-
4 ,,	12 ,,	98	60/-
5 ,,	14 ,,	125	65/-
7 ,,	14 ,,	160	65/-
8 ,,	14 ,,	170	70/-
10 ,,	14 ,,	210	70/-
12 ,,	14 ,,	230	75/-

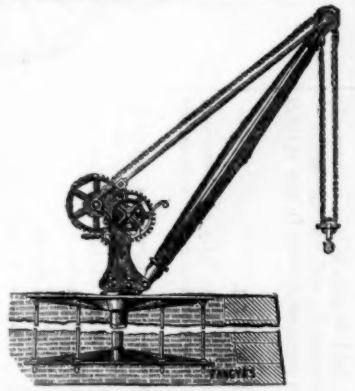
The 12 cwt. and 1 ton Cranes have single purchase gear only and fixed balance boxes.

This Crane can be supplied with wrought-iron tubular, or plated jibs, and wrought-iron carriage with chequered iron floor plates, at an extra cost.

Our Patent Safety Brake, as described in catalogue, can be applied to above Crane at a slight extra cost. This Brake has the valuable property of safely sustaining the load when the men have left the handles.

In ordering, state gauge of rails or if required for roads.

TANGYES' HAND WHARF CRANE.



With single and double purchase lifting gear, powerful strap brake and lever, two winch handles, strong iron crane post and foundation plates and bolts, wood jib, turned roller path, sufficient chain, with block, to reach ground level.

Tested to	Radius.	Price.
12 cwt.	8 ft.	£23
1 ton.	8 ,,	32
1½ ,,	9 ,,	37
2 ,,	10 ,,	41
3 ,,	12 ,,	48
4 ,,	12 ,,	70
5 ,,	14 ,,	87
8 ,,	14 ,,	141
10 ,,	14 ,,	165

The 12 cwt. and 1 ton Cranes have single purchase gear only.

This Crane can be supplied with wrought tubular jib at an extra cost.

Our Patent Safety Brake, as described in catalogue, can be applied to above Crane at a slight extra cost. This Brake has the valuable property of safely sustaining the load when the men have left the handles.

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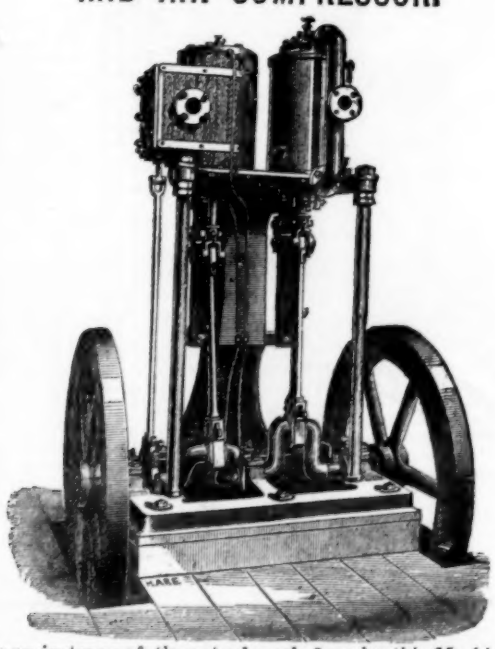
"Champion" Rock-borer
AND AIR COMPRESSOR.



As an instance of the actual work done by this Machinery in various kinds of ground, some of it the hardest rock, it may be mentioned that in Cornwall, irrespective of the work performed by the "Champion" Rock-borers and Air-compressors purchased by various Mines, the drivage, rising, sinking, and stoping done by contract by the Proprietor with his own Machinery now amounts to over 1150 fathoms.

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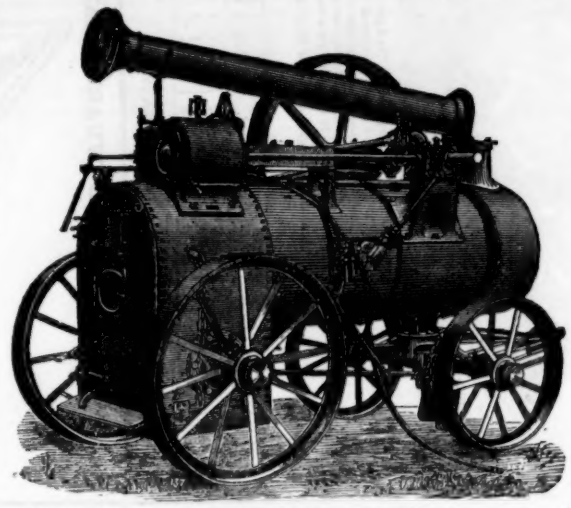

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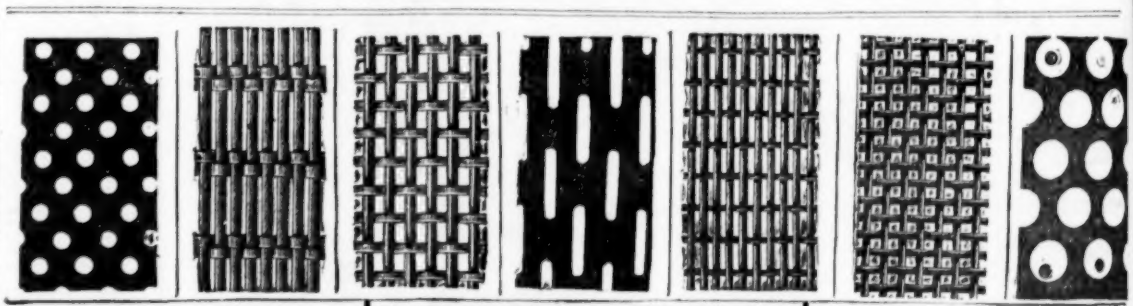

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Jigger Bottoms, Trommels, Cylinder Covers, Riddles, Sieves for Diamond, Gold, Silver, Copper, Lead and Tin Mines.

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FRANCIS MORTON AND CO., LIMITED, LIVERPOOL,

MANUFACTURERS OF

GALVANISED CORRUGATED IRON ROOFS, BUILDINGS, AND SHEDDING,

WHICH THEY HAVE EXTENSIVELY ERECTED FOR THE REQUIREMENTS OF

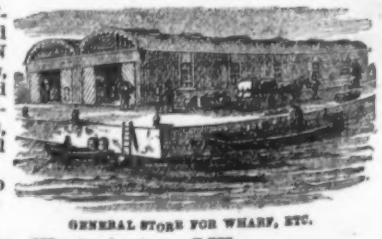
Forges, Rolling Mills, Puddling Sheds, Ironworks, and Collieries

Erected Complete in this Country, or prepared to Plan for Erection Abroad.

OPEN SHED FOR COVERING LARGE AREAS

GALVANISED OR PAINTED CORRUGATED IRON ROOFING PLATES and TILES. HEAVY CORRUGATED IRON PLATES for fireproof floors, roadways, parapets, &c. (for producing which F. M and Co. have recently laid down powerful Hydraulic Machinery). Wrought-iron Tanks, Guttering, and General Constructional Wrought Ironwork.

DESIGNS PREPARED, AND ILLUSTRATED DESCRIPTIVE CATALOGUES FORWARDED ON APPLICATION



GENERAL STORE FOR WHARF, ETC.

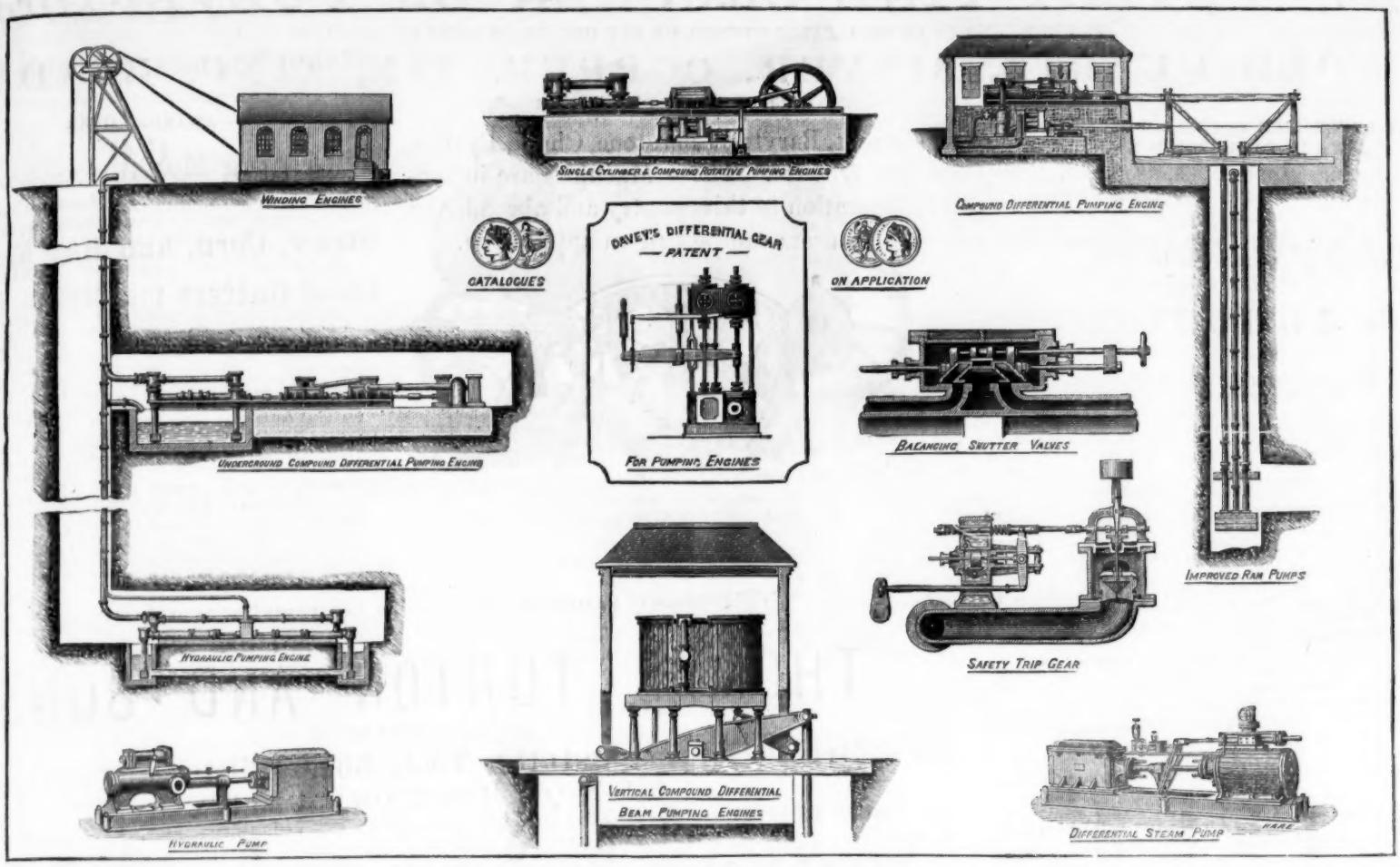
ondon Office: 9, Victoria Chambers, Victoria Street), Westminster, S.W.

(Rooms Nos. 27 and 28, on the First Floor.)

HATHORN, DAVEY & CO.,

PUMPING MACHINERY.

MINING MACHINERY.



SUN FOUNDRY, LEEDS.

BELL'S ASBESTOS.

BELL'S PATENT ASBESTOS BLOCK PACKING for High-Pressure Engines.

The following testimonials refer to this Packing:—

Mona Lodge, Amlwich, Anglesey,
2nd August, 1884.

Dear Sir,—I have much pleasure in answering your note. Bad times in mining have compelled me to try all kinds of expedients in order to effect saving; some have succeeded and some have failed, but my underground manager, Capt. Hughes, has just said to me by the telephone—"The Asbestos Packing is the best thing ever brought here."

It saves money and trouble, but like my gas purifying oxide it lasts so long that you must not expect another order from me for twelve months at least.

Yours truly, T. F. EVANS,
Late H.M. Inspector of Metalliferous Mines.

Mr. J. Bell.

Manchester, Sheffield, and Lincolnshire Railway—Steamship Department,
Grimsby, April 10th, 1884.

Dear Sir,—I have much pleasure in stating that after a trial of over nine months, and comparing it with other packings, I can confidently recommend your Asbestos Packing. It is especially valuable when high-pressures are employed, as in cases where other packings have perished, owing to high temperatures, your packing has invariably stood well. I have also used it with complete success when a gland has heated with other packings, and also in cases of badly scored piston rods. I consider the results I have obtained by its use for our marine engines to have been in every way highly satisfactory. Yours truly,

Mr. J. Bell. G. H. CLARKE, Sup. Engineer.

Department of the Director of Navy Contracts,
Admiralty, Whitehall, 20th June, 1884.

Sir,—I have to inform you that your tender has been accepted for Bell's Rolled Cloth Asbestos Packing to sample submitted:—Elastic core ... ... Round.
" " ... ... Square.

To Mr. John Bell. JOHN COLLETT, Director of Navy Contracts.

The Patent Block Packing is square, as Fig. 1 and Figs. 2 and 3 represent the Round Block Packing with solid and hollow rubber core, and Fig. 4 without core, but with rubber inlaid. As these packings are extensively imitated, and as it is a common practice among dealers and agents to supply the cheaper manufactures at my list prices, users are requested to see that the packing supplied to them bears the trade mark.

BELL'S ASBESTOS BOILER PRESERVATIVE.—This useful mixture by absorbing the free oxygen that is in the water entirely checks pitting and corrosion. It also disintegrates incrustation so immediately as to prevent its adhering to the plates. Not only is a great economy of fuel effected by keeping boilers clean, but the risk of having the plates burned is thereby obviated. It has been computed that ⅛ in. thick of incrustation causes a waste of 15 per cent. of coal; ¼ in., 60 per cent.; ⅜ in., 150 per cent. Thus the Preservative avoids the great risks which are inseparable from scaled plates, lengthens the life of a boiler, and covers its own cost a hundredfold by economy of fuel. It is entirely harmless, and has no injurious action on metals. It can be put into the feed tank or boiler, as may be most convenient. Sold in drums and casks bearing the Trade Mark, without which none is genuine.

BELL'S ASBESTOS YARN and SOAPSTONE PACKING for Locomotives and all Stationary Engines running at very high speed with intense friction. Sandwell Park Colliery, Smethwick, 1st February, 1884.

To Bell's Asbestos Works.

Dear Sirs,—I have much pleasure in stating that I have used your Asbestos Packing for the last 13 months for our large winding engines which are running night and day, and also for the fan, pumping, and hauling engines at the above Colliery, and during that period we have not used more than one-third the Packing we had formerly; and this I attribute to your Packing on account of its great durability and general excellence of quality.—I am, dear Sirs, yours faithfully,

THOMAS WINTER, Colliery Engineer.

BELL'S ASBESTOS.

The goods of this house are of the highest quality only, and no attempt is made to compete with other manufacturers by the supply of inferior materials at low prices. All "home" orders should be sent direct to the undermentioned depôts and not through Agents or Factors.

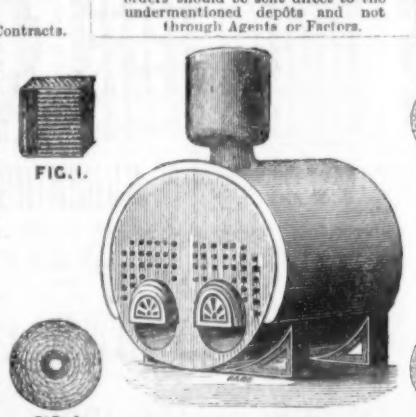


FIG. 1.

FIG. 2

FIG. 4.

FIG. 3.

BELL'S ASBESTOS BOILER AND PIPE COVERING COMPOSITION, for coating every class of steam pipes and boilers, non-combustible and easily applied when steam is up; adheres to metals and preserves them from rust; prevents the unequal expansion and contraction of boilers exposed to weather; covers 50 per cent. more surface than any other coating, and is absolutely indestructible. It can be stripped off after many years' use, mixed up with 20 per cent. of fresh, and applied again. The composition is supplied dry, and is only to be mixed with water to the consistency required for use.

A Horizontal Boiler, 17 ft. 6 in. long, 15-H.P., gave the following results:—

Temperature on Plates - - - 186 deg.
" " Covering - - 94 deg.

One ton of coal was saved per week, and although the fire was raked out every evening, 20 lbs. of steam were found in the boiler next morning.

The following Testimonials refers to this Covering:—

Offices of the Wimbledon Local Board, Wimbledon, Nov. 28th, 1883.

Dear Sir,—It may interest you to know that we save exactly 46 per cent. in fuel through using your covering. Yours truly, W. SANTO CRIMP, C.E., F.G.S.

The Tamar and Kit Hill Granite Company (Limited),
Mr. John Bell, Southwark, S.E. Gunnislake, Tavistock, 8th April, 1884.

Sir,—I have much pleasure in stating that the Asbestos covering applied by you to the boiler of our travelling crane at Kit Hill has yielded most remarkable results. Since it has been in use we have saved fully half our coals, and have effected a great saving in the time it takes to get up steam, which is often a matter of great importance to us. I should add that the crane runs on high gantries, and is fully exposed to all weather. I have formed the highest opinion of your Asbestos as used for this purpose, and as you are aware, have had another boiler similarly covered, though it has not since been used. I can most strongly recommend the material.

I am, Sir, yours faithfully, W. J. CHALK, Assoc. M. Inst. C.E., Engineer and Manager.

BELL'S ASBESTOS and INDIA-RUBBER WOVEN TAPE and SHEETING, for making every class of Steam and Water Joints. It can be bent by hand to the form required without puckering, and is especially useful in making joints of manhole and mudhole doors. It is kept in stock in rolls of 100 ft., from ⅛ in. to 3 in. wide, and any thickness from 1/16 in. upwards. Manhole covers can be lifted many times before the renewal of the jointing material is necessary. The same material is made up into sheets about 40 in. square, and each sheet bears the Trade Mark, without which none is genuine. It is very necessary to guard against imitations of this useful material, and to secure themselves against being supplied with these inferior articles at my price, users are recommended to see that every 10 ft. length of the Asbestos Tape purchased by them bears the Trade Mark.

BELL'S SPECIAL LONDON-MADE ASBESTOS MILLBOARD, for Dry Steam Joints, made of the best Asbestos fibre, is well-known for its toughness and purity, and is absolutely free from the injurious ingredients frequently used to attain an appearance of finish, regardless of the real utility of the material. Made in sheets measuring about 40 in. square, from 1-64th in. to 1 in., and ½ millimetre to 25 millimetres thick. Each sheet bears the Trade Mark.

The following copy of acceptance of tender refers to above:—

Department of the Director of Navy Contracts.
Admiralty, Whitehall, S.W., 17th May, 1884.

Sir,—I have to inform you that your tender for Asbestos Millboard has been accepted.—Mr. John Bell. JOHN COLLETT, Director of Navy Contracts.

BELL'S ASBESTOS EXPANSION SHEETING (PATENT). This Sheeting is another combination of Asbestos with India-rubber, giving to the steam user the special advantages of both materials. The India-rubber Washer is protected from the action of heat and grease by an outer coating of vulcanised Asbestos Cloth, thus producing an excellent joint where expansion and contraction render other materials unserviceable. This material is admirably suited to steam pipe joints and every class of valve. Valves made of this material are very durable, as they are not subject to injury by oil.

BELL'S "ASBESTOS LUBRICANT."

REG.D

ILLUSTRATED PRICED CATALOGUE FREE ON APPLICATION TO

BELL'S ASBESTOS WORKS, SOUTHWARK, LONDON, S. E.

OR THE DEPOTS—118a, SOUTHWARK STREET, S.E.,

Victoria Buildings, Deansgate, MANCHESTER. 11 and 13, St. Vincent Place, GLASGOW. 39, Mount Stuart Square, CARDIFF. 21, Ritter Strasse, BERLIN.

THE BLAKE-MARSDEN NEW PATENT IMPROVED STONE BREAKERS AND ORE CRUSHERS.

ORIGINAL PATENTEE AND ONLY MAKER.

H. R. MARSDEN,

ALSO PATENTEE AND ONLY MAKER OF THE

NEW PATENT FINE CRUSHER OR PULVERIZER,

FOR REDUCING TO AN IMPALPABLE POWDER, OR ANY DEGREE OF FINENESS REQUIRED,

GOLD QUARTZ, SILVER, COPPER, TIN, ZINC, LEAD

AND ORES OF EVERY DESCRIPTION

PATENT REVERSIBLE CUBING and CRUSHING JAWS, IN FOUR SECTIONS,

WITH PATENT FACED BACKS, REQUIRING NO WHITE METAL IN FIXING.

CRUCIBLE CAST-STEEL CONNECTING RODS. RENEWABLE TOGGLE CUSHIONS, &c.

OVER **4000** IN USE.

Also Cement, Barytes, Limestone, Chalk, Pyrites, Coprolite, &c., &c. These Machines are in successful operation in this country and abroad, and reference to users can be had on application.

AWARDED OVER

60

FIRST-CLASS GOLD AND SILVER MEDALS.

ADOPTED BY THE PRINCIPAL CORPORATIONS, CONTRACTORS, MINING COMPANIES, &c., IN ALL PARTS OF THE WORLD.

ROAD METAL BROKEN EQUAL TO HAND, AT ONE-TENTH THE COST.

EXTRACTS FROM TESTIMONIALS.
PULVERIZER.

"I have great pleasure in bearing testimony to the merits and capabilities of your patent combined fine crusher and sieving apparatus. I have tried it on a variety of ores and minerals, and it pulverizes them with equal success. You can put in a small paving stone and bring it out like flour."

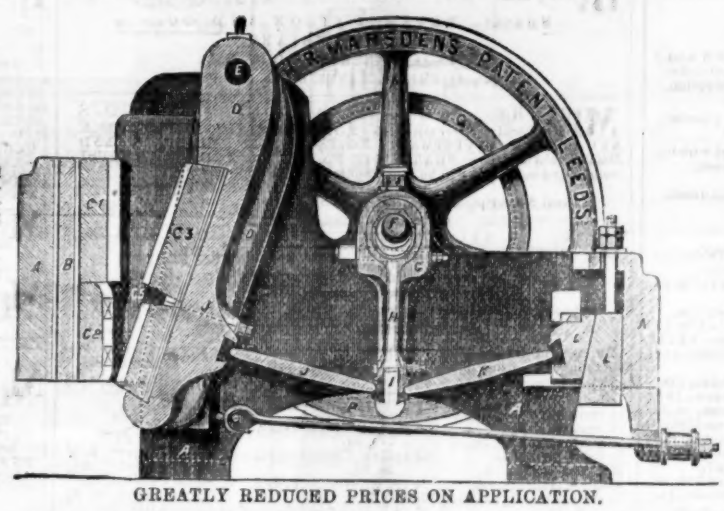
"In reply to your favour, I have much pleasure in informing you that the 12×3 Pulverizer we had from you is giving us every satisfaction. The material we are operating on is an exceptionally hard one. I am well satisfied with its working."

"Our experience is that the motion and mechanical arrangements of your machine are the best for pulverizing that we have ever met with."

"The reports from our mines as regards the working of your Fine Crusher (20×5) recently supplied are very favourable, although we cannot quote you exact figures. On being got into position it was tried *by hand*, with the result that it made short work of the biggest pieces of ore we put into the hopper. You might say how long you would take to deliver another of the same size."

"As I once before stated, your machine is a perfect pulverizer."

"I am sure the machine will be a success, and a great one, and there is any amount of demand for such a machine. We can work it with 20 lbs. of steam, and our engine, which is a 12-h.p., plays with the work, in fact we run the Stonebreaker and the Pulverizer both together with 35 lbs."



GREATLY REDUCED PRICES ON APPLICATION.

EXTRACTS FROM TESTIMONIALS.—STONEBREAKER.

"I now order Three of your Stone Crushers, size 15 × 10, to be your very best construction, and to include two extra sets of Jaws and Cheeks for each. The last two 24×13 machines you sent which are at work in this colony, are doing very well. You soon find that the railway contractors will adopt your machines preference to the colonial ones—two of which I have. I know contractors have had as many as nine of them, which have not very good satisfaction. Once they know of yours thoroughly believe you will do a good trade with the colonies. For reference the high character of your constructions you can refer to having used them with the very best results, both in New Zealand and this colony, and much prefer them to the colonial article, in point of construction and less liability to go out of order. material we are crushing is very hard blue stone, for railway purposes. Push on with the order as quickly as possible; I do think it necessary to have any engineering inspection. I brought your machines prominently under the notice of all contractors in this colony, likewise the Government. Many of contractors have spoken to me in reference to their capabilities, I could only tell them that they are by far and away the best most economical I ever used. The very fact of me having purchased now Eleven from you at various intervals and various sizes, and above 12 years ago, and having tried all the other makers, is sufficient guarantee of the capabilities and the working of your machines. Yours in every way surpass all others."

"Some of your testimonials do not give your machines half their due. I have seen men hammering away on a big rock for a quarter of a day which your machine would reduce to the required size in quarter of a minute. I would guarantee that your largest size machine would reduce more of the Cornish tin capels (which is the hardest rock of England) n a day than 200 men, and at 1-20th the cost."

FOR CATALOGUES, TESTIMONIALS, &c., APPLY TO THE SOLE MAKER,

H. R. MARSDEN, SOHO FOUNDRY, LEEDS.

JOHN CAMERON'S

SPECIALITIES ARE HIS

STEAM PUMPS

FOR

COLLIERY PURPOSES.

Specially adapted for forcing Water any height

ALSO, FOR

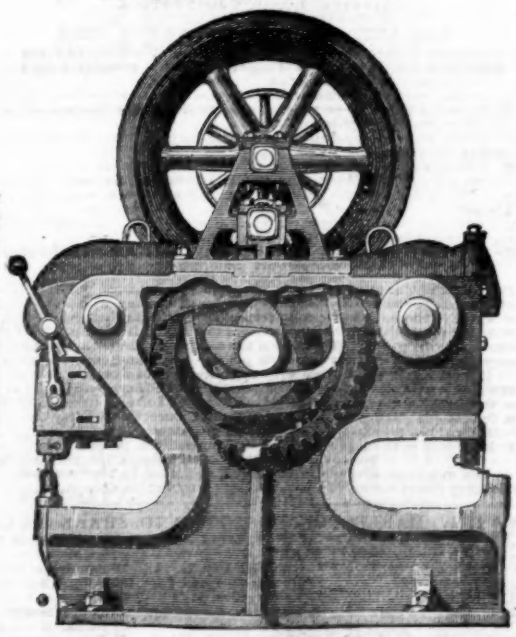
SINKING, FEEDING BOILERS AND STEAM FIRE ENGINES,

Of which he has made over 9000.

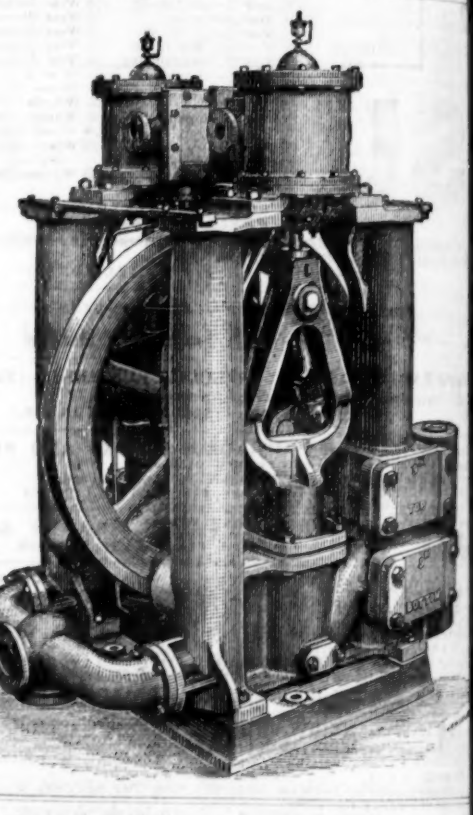
ALSO, HIS

PATENT CAM AND LEVER PUNCHING AND SHEARING MACHINES.

FLY-WHEELS ON BOTH SIDES.



DISENGAGING APPARATUS.



Works: Oldfield Road, Salford, Manchester.

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For NEWCASTLE and EAST COAST—E. BECKWITH AND CO., BONNERSFIELD, SUNDERLAND.

HEPBURNS' PUMP LEATHER WATERPROOF

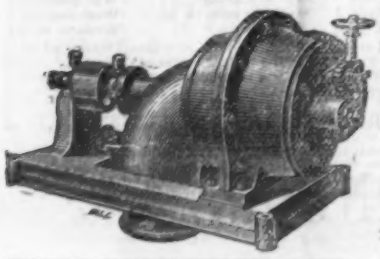
By a special method of preparation this leather is made solid, perfectly close in texture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made. It may be had of all dealers in leather, and of—

HEPBURN AND GALE, LIMITED.
TANNERS AND CURRIERS,
LEATHER MILL BAND AND HOSE PIPE MANUFACTURERS,
LONG LANE, SOUTHWARK, LONDON.
Prize Medals, 1851, 1855, 1878, for
MILL BANDS, HOSE, AND LEATHER FOR MACHINERY PURPOSES.

WATER POWER,

UTILISED WITH THE GREATEST ECONOMY AND EFFECT BY THE PATENT "TRENT" TURBINE.

As arranged, with a horizontal spindle, it is specially adapted for MINING PURPOSES.



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ANCHOLME FOUNDRY,
BRIGG,
ENGLAND.

The Patent Trent, New American Hercules, & Victor Turbines.

ESTABLISHED 1825.

EDWIN LEWIS AND SONS,

Patent Tube Works, MONMORE GREEN and Britannia Boiler Tube Works, ETTINGSHALL,

WOLVERHAMPTON.

MANUFACTURERS OF

Lapwelded & Buttwelded Wrought-iron, Steel, or Homogeneous Tubes

FOR EVERY

COLLIERY OR MINING PURPOSE.

J. WOOD ASTON AND CO., STOURBRIDGE

(WORKS AND OFFICES ADJOINING CRADLEY STATION),

Manufacturers of

CRANE, INCLINE, AND PIT CHAINS,

Also CHAIN CABLES, ANCHORS, and RIGGING CHAINS, IRON and STEEL SHOVELS, SPADES, FORKS, ANVILS, VICES, SCYTHES, HAY and CHAFF KNIVES, PICKS, HAMMERS, NAILS, RAILWAY and MINING TOOLS, FRYING PANS, BOWLS, LADLES, &c., &c.

Crab Winches, Pulley and Snatch Blocks, Screw and Lifting Jacks, Ship Knees, Forgings, and Use Iron of all descriptions

WELDED STEEL CHAINS { FOR CRANES, INCLINES, MINES, &c., MADE ALL SIZES.

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